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# SURGICAL CLINICS OF CHICAGO

Volume 1

Number 1

CLINIC OF DR. A. D. BEVAN

PRESBYTERIAN HOSPITAL

## GALL-STONE DISEASE

*Summary* Diagnosis and treatment of gall-stone disease as practised in 1860, development of operative treatment, cholecystotomy, cholecystectomy, cholecystenterostomy, choledochotomy, transduodenal choledochotomy, experience of Musser and Keen, etiology of gall stones—"stone bearing catarrh", incidence of gall stones, why gall stones cause pain—movement of the stone due to peristaltic action of minor importance, symptoms of gall stones may be purely mechanical, but usually mean the lighting up of a bile-tract infection, spontaneous passage of large gall stones due to pathologic cholecystenterostomy, history and physical examination of a patient with acute suppurative cholecystitis, operation following subsidence of acute symptoms, technic of cholecystectomy in the presence of massive adhesions, postoperative treatment, postoperative complications, the medical treatment of gall stones, the diagnosis of gall stone disease, cholemia—its importance in relation to the operative risk, pancreatitis and gall stone disease, gall stones and cancer, gall-stone ileus, surgical therapy for all gall stone cases which are good surgical risks, summary of the indications affecting the choice of the operation, cholecystectomy in 90 per cent of the cases necessity of a wide exposure of the operative field in order that thorough work may be done

*November 6, 1916.*

I WANT to take up this morning an important part of abdominal surgery, namely, gall-stone disease. I will give you the essential facts in the etiology and diagnosis of gall-stone disease. I want to say a word or two in reference to the history as we find it today, and I shall operate upon a patient in whose case the clinical diagnosis of gall-stone disease has been made.

Of course, gall-stone disease has been known for centuries, I am not going to ask you to go back and review the ancient literature of the subject. I would, however, like to refer you to some lectures that will give you a pretty full idea of what was known of this subject in 1860. Those are the lectures of Trou-

seau on gall stones in his "Clinical Lectures" which are published by the Sydenham Society, which you will find in most medical libraries Up to the time of Trousseau practically nothing was known in regard to gall stone surgery It was known that cholelithiasis was not infrequently encountered but the medical men of that day did not attempt to make a definite diagnosis of gall stone disease unless in the history of the case the patient had passed gall stones per rectum Even where the clinical picture to us would seem perfectly clear—i e, repeated attacks of gall stone colic and even jaundice—the clinicians of that time did not attempt to make an absolute diagnosis unless the gall stones were recovered in the feces Of course, we know that this is not very often done that we have dozens of gall stone cases that do not pass gall stones into the bowel to one where this occurs Not only that but we know now that gall stones are sometimes disintegrated in their passage through the bowel and that even when gall stones are extruded from the bile tract a certain percentage are never recovered in the feces but are disintegrated in their passage through the intestinal tract This has been proved by having a man swallow gall stones that have been removed from another case and then watching the case carefully and finding we could not always recover the stones that they had disintegrated in their passage through the alimentary canal How often this happens we do not know but we do know that it occurs At the time of Trousseau though this very limited amount of knowledge which I have roughly sketched to you was known in regard to gall stones practically nothing was done in the way of operative treatment These patients were never operated upon unless an abscess developed at the site of the gall bladder and pointed toward the skin and was then incised Of course the clinicians of those days handled a number of cases where this occurred Opening the abscess through the skin would permit the bile and gall stones to pour out When I gave this course last year I had an opportunity of showing one of these cases

A man came into the clinic with a history of repeated attacks of gall stone disease and with a history of an abscess in the right

upper quadrant of the abdomen almost ready to break through the skin. Under gas we made an incision through the skin and out poured a lot of pus, bile, and gall-stones. He made a recovery from the profound septic condition in which he was when

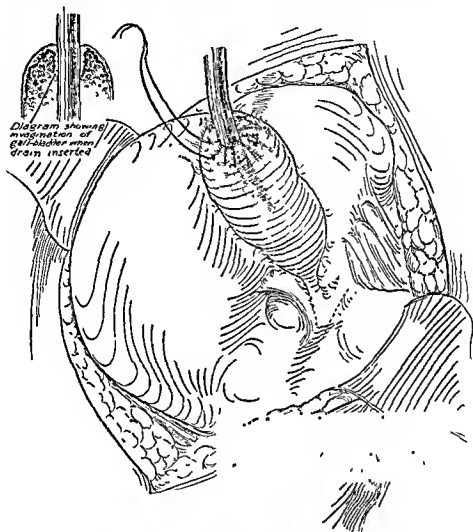


Fig 1 —Cholecystostomy. Note invagination of gall-bladder about rubber drainage-tube by two purse-string sutures of catgut.

he came to the clinic and refused to have the radical operation done. The wound eventually healed and remained healed for a short time, and then he had a recurrence of the symptoms, but not nearly of such an intense degree, and after some pain and evidence of sepsis the fistulous tract opened up again and out



poured some more pus, bile and a few gall stones After he had this second attack he consented to allow me to operate I did a radical operation a cholecystectomy, a removal of the gall bladder and the cystic duct, both of which contained gall stones,

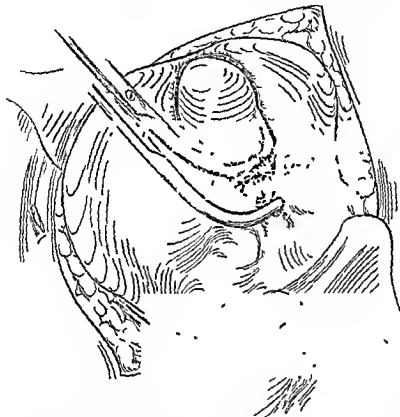


Fig 2—Cholecystectomy Dissection from below The cystic duct and artery are grasped by two full-curved clamps After cutting between the clamps the gall bladder may be shelled out quite readily with a minimum of hemorrhage since the cystic artery is under control from the beginning

and the man went on to a permanent recovery That you might describe as one of the old fashioned cases of neglected gall stone disease as such cases necessarily were neglected in the time of Trousseau

The first operation that we find recorded definitely for gall

stones was performed by Bobbs in Indianapolis in 1867. That was the same year in which Lister made the first report on anti-septic treatment. Then, in 1878, Marion Sims and Lawson Tait began to do the rather simple operation of *cholecystotomy*, an in-



Fig. 3.—Cholecystectomy Dissection from above. This method frequently becomes a necessity when the direct approach to the cystic duct and artery, as shown in Fig. 2, is obstructed and the clamps cannot be applied until the gall-bladder has been freed.

cision into the gall-bladder, removal of the stones, and drainage of the gall-bladder (Fig. 1). This was the first operation that was done, and, of course, in quite a proportion of the cases it was successful. In about 1882 Langenbuch removed the gall-bladder for the first time—the operation of *cholecystectomy* (Figs. 2 and 3).

A few years later Winiwarter introduced the operation of *cholecystenterostomy* (Fig 4). A *cholecystenterostomy* is the establishment of anastomosis between the gall-bladder and the intestine

In 1885 Charles T. Parkes, who was then professor of surgery in this clinic, suggested the operation of *choledochotomy*, a direct

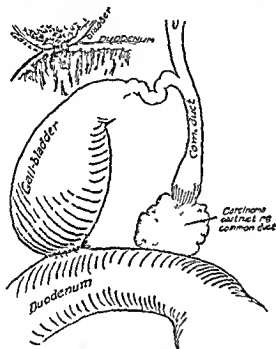


Fig 4—Cholecystenterostomy Indicated in the presence of permanent obstruction of the common duct The insert shows a section through the anastomosis and the two layers of sutures which maintain it—an inner hemostatic stitch including all the tissue layers and an outer Lembert

incision into the choledochus or common duct for the removal of gall-stones floating or impacted there (Fig 5) Fenger, in a classical article in the "American Journal of the Medical Sciences" some years later, in discussing ball valve action of stone in the common duct, gave Parkes credit for first suggesting choledochotomy Unfortunately, Parkes' article was published in a local medical journal with limited circulation and did not

receive much attention. Parkes did not have the opportunity in the few years he lived after this time—he died in 1889—of doing a choledochotomy. Then a few years later the final operation of importance that has been developed in connection with the bile tracts was introduced by Charles McBurney, the New



Fig. 5.—Choledochotomy.

York surgeon who did so much to develop the surgery of appendicitis. That operation, known as *transduodenal choledochotomy*, is for the removal of stones impacted in the ampulla. McBurney's method was to make a direct incision in the duodenum and remove the stone from the inside of the duodenum. He then closed the small incision that had been made in the duodenum.

These are the steps that mark the progress of the surgery of gall stone disease To show how recent this work is, let me refer to the fact that in the "American Journal of the Medical Sciences" in 1884 John Musser and W W Keen, of Philadelphia, have the first extensive article on the subject of gall stone surgery that was published in this country They report 3 cases done by Keen Musser was the internist and Keen was the surgeon They also tabulated all the gall stone cases that had been done up to that time as far as they could obtain the literature They could collect only 85 cases Keen in some of his cases opened the peritoneal cavity in what seemed to be perfectly clear pictures of gall stone disease, and found extensive adhesions around the gall bladder, burying the gall bladder in adhesions between the omentum and transverse colon, the stomach, and the liver In such cases he would retreat, with the statement that he did not think it was justifiable to go ahead and separate those adhesions One of the most illuminating statements in this article is the last sentence, which is as follows "The authors are very much gratified to find, after reviewing these 85 cases, the mortality in this series of cases was so low, only 30 per cent of the patients died" Now, to our modern surgeon that is most interesting because the mortality has been reduced to 1 or 2 per cent in ordinary gall stone cases where the stones are in the gall bladder and cystic duct, somewhere near 5 per cent where the gall stones are in the common duct

Now a word in regard to the etiology of gall stones Gall stones are the result of a mycotic infection of the mucous membrane of the bile tracts As a rule, they are formed in the gall bladder but sometimes in other parts of the biliary tract It is a mycotic infection of the mucous membrane what the old time surgeons used to call a "stone bearing catarrh" when they were discussing the subject of the formation of stones in the kidney or the urinary bladder It was recognized for years that the most important factor in the development of stones in the bladder or in the kidney was a catarrhal condition of the mucous membrane, leading first to the formation of nuclei of masses of bacteria or mucus around which the salts of the urine, in the case of the kid

ney or bladder, might crystallize and form calculi. The same thing happens in the gall bladder. The mycotic infection of the mucous membrane of the gall bladder results first in the development of a mass of bacteria or blood or mucus around which there is deposited cholesterol. In the formative stage these masses of cholesterol are soft, like putty. We have had occasion in our operations to see gall stones in their formative stage, when you could pick them out and squeeze them out of shape just as you can putty. Usually there is deposited around this mass bilirubin calcium and biliverdin calcium and carbonated calcium forming a sort of shell. This process may be repeated, so that in some gall stones when you split them open you find a number of layers like an onion—a nucleus, and around that a mass of carbonated calcium, bilirubin or biliverdin calcium, and around that another layer of cholesterol, and then still another layer of carbonated calcium or bilirubin or biliverdin calcium, and so on.

A word in regard to the cause of mycotic infections. The main cause is probably the colon bacillus. The typhoid bacillus is also a common cause. Pus organisms of a comparatively low degree of virulence, as the staphylococcus and streptococcus may be the cause of the mycotic infection. Gall stones are not produced by virulent infections of the gall bladder. The infection must be of a low type and not one that produces pus but one in which we find simply a catarrhal inflammation. That we may have aseptic gall stones I have little doubt. I think that there is evidence to show that the course of events necessary to lead up to gall stone formation may be purely chemical and not mycotic, but the clinical picture is usually that of a mycotic infection.

In regard to the number of gall stones, they may be single or multiple. When they are single in the gall bladder they are usually oval and round. When they are multiple, they are usually faceted. Are these facets polished off? No, they are made exactly like the honeycomb of the bee. If the bee made a single honeycomb it would be round on transverse section. If he makes forty, they are crowded together, and you get the faceted picture that you find in the honeycomb. The same thing is true of gall-stones. If you have forty pieces of soft putty like choles-

tern in the gall bladder under pressure, these forty soft masses are pressed together and produce these facets. Then each one of these facets is usually covered with carbonate of calcium or other calcium salts in the bile and give you the faceted picture that is so common where we have multiple gall stones. Stones in the cystic duct and in the common duct are often faceted. Why? Because they are stones that have been forced from the gall bladder into the cystic duct and into the common duct. Where a stone is formed in the cystic duct or where it is formed in the common duct, it is either round or oval. Not infrequently where we have several gall stones formed in the cystic duct we have the picture of barrel shaped stones in the cystic duct, rather definite and rather easily recognized. So much for the etiology.

What about the natural history of gall stone disease? What are the factors that lead to this mycotic infection of the gall bladder and biliary tracts generally? Primarily a stagnation of the bile, more frequent in women than in men, because of the greater activity on the part of men and because of the tighter clothing in women and because of the incident of pregnancy in women. Gall stone disease is about five times as common in women as in men. In regard to the age, gall stones are rare in early life. We occasionally find a patient under ten, but we have had very few out of the large series of gall stone cases which we have observed. We have few under twenty, comparatively few. More common after pregnancy, not very frequent from twenty to thirty, more frequent from thirty to sixty in women. In talking about the natural history we find this interesting fact, that in postmortem statistics and in the statistics we used to obtain from our cadavers when I was an anatomist probably 10 per cent or more of the people over fifty have gall stones. In a large proportion of these the ages of which it is difficult to state there was no evidence of the existence of gall stone disease in the case during life. The patient had had no symptoms. In other words, gall stones may remain latent for years or permanently in an individual without producing any symptoms of their presence. I am satisfied that this is not at all an uncommon thing. But if they do produce symptoms, how are the symptoms produced?

In two ways, first in a purely mechanical way in the effort of the biliary tract to expel the stones, as in the effort of the gall bladder to push gall stones out through the cystic duct. But what is much more important is the occurrence of repeated infections of the bile tract, the presence of gall stones lighting up an acute coryza of the bile tract if you please just as we have a cold in the head. These acute infections result in the development of great quantities of mucus and in a swelling of the mucous membrane and if we have in that case a stone in the cystic duct, this prevents the outflow of bile or the entrance of the bile and the outflow of mucus. Now what happens? The gall bladder mucosa continues to secrete, and under the stimulation of the acute infection with the accumulation of the mucus you have what? An increase of the intracystic tension. The gall bladder is distended by this accumulated mucus and that produces the pain. Pain in gall bladder disease is due to the intracystic tension. It is not due to peristaltic action alone. How do we know that? Take a case of stone with intense colic and the stone impacted in the cystic duct. Under local anesthesia open the gall bladder, put in a rubber tube the tension of the gall bladder is relieved and the pain ceases. Another group of cases illustrates that beautifully—the patient is operated on for gall stones and unfortunately one is left in the cystic duct. The patient makes a good recovery, the external wound heals up within a short time. Then the patient has an attack of colic, and within a few days that old fistula opens up and out pours some mucus and possibly a little pus and the pain is gone the minute the opening is re established and the intracystic tension relieved. Now we have watched this with kidney stone cases with a great deal of interest. Take a case for instance where we have a stone impacted in the ureter with intense colic, sometimes anuria sometimes complete anuria with stone in both ureters or sometimes when the stone is in a single ureter, there develops a complete anuria mechanical on one side and reflex on the other, the patient passes no urine whatever. Now under those conditions I have not infrequently had to do a nephrotomy. Under gas anesthesia I open the pelvis and introduce a tube



The pain disappears at once. The  $x$  ray picture shows the kidney stones impacted in the upper end of the ureter 2 inches or so from the pelvis. Three days later another  $x$  ray picture is taken and the stone is found to be halfway down to the bladder. A few days later it passes down to the bladder and is passed per urethra. Now in all the period in which that stone travels through the ureter as long as you have a tube in the pelvis of the kidney you have no pain whatever. In other words this condition of pain is due to the tension in the kidney to the intrarenal tension and in the bile tract to the intracystic tension if it is limited to the gall bladder or if it involves the common duct to the tension that is put on the common duct and of course on the intrahepatic ducts as well. It is very much easier to produce this complete obstruction with a swollen mucous membrane and with a stone in the cystic duct or the common duct than with a mucous membrane that is approximately normal. That is especially true where the stone is in the common duct. When the mucous membrane of the common duct is not swollen the stone moves freely up and down like a ball valve. Then when the mucous membrane is swollen from a lighting up of an inflammatory condition you have obstruction with pain and jaundice. I would like very much to have this matter perfectly clear in your minds that the symptoms in gall bladder disease may be perfectly mechanical but usually mean the lighting up of an inflammation in the bile tract.

If you will examine the cystic duct carefully you will find an arrangement of the mucous membrane the valve of Heister in an S shaped curve that makes it almost impossible to pass a small probe through and a very small stone cannot pass through the normal cystic duct. As the result of a gradual dilatation of this cystic duct small gall-stones can pass through and then larger ones until finally fair sized gall stones can pass through a dilated cystic duct but that is not the usual way of getting rid of gall stones especially in those cases where the patients come to you with a handful of gall stones which they have passed after some serious attack. That happens because a spontaneous pathologic cholecystenterostomy has developed. Now what do I mean by that?

The gall-bladder becomes adherent to the duodenum, and the pressure-necrosis produces a perforation between the gall-bladder and the duodenum, and the stones pass into the small bowel, or they may escape into the transverse colon or into the stomach.

Now I will digress for a short time and go on with the operative side of this case.

### HISTORY

The patient, a married woman of thirty-two years, was admitted to the hospital complaining of pain in the right upper quadrant of the abdomen, nausea, vomiting, chills, fever, headaches, and shortness of breath.

She had her first attack ten years ago while in Europe. Previous to this the patient felt perfectly well. The pain, which was sharp in character, localized in the right upper quadrant and never radiated to the back or right scapula. The pain was present constantly for four months, during which time she was in bed. It was only relieved by morphin hypodermically twice a day. She was nauseated and vomited daily. No blood was present in the vomitus, but it was yellowish in color. Chills and fever were also present. After four months the symptoms disappeared until four days ago.

Four days ago the attack came on at 5 A. M. while the patient was in bed. It was associated with nausea and vomiting. There was no blood in the vomitus at this time. The pain was located in the subcostal region and never radiated to the back. There was less pain when she lay upon the abdomen. Morphin was given for relief. The patient has eaten nothing for four days for fear of increasing the pain. Headache began yesterday and has persisted up to the present time. She also complains of shortness of breath.

Past and menstrual histories are negative. She was married at seventeen. Her husband is living and well. Five children are living and well. She has never had typhoid. She was jaundiced for four months with the first attack.

Her temperature on admission was 101.8° F. and then went to 102° F. The next day it went down to 99.8° F. The third day it went up to 101.2° F., and has been going up around 100° F.

every evening The leukocyte count is normal around 8000 Urine is negative There is distinct rigidity and tenderness over the gall bladder

You note that her first attack was after her marriage and after her pregnancy Pregnancy is an important element in gall stone disease The acute symptoms are gone It is wise to wait until the acute symptoms are over before operating on these cases

### OPERATION

Now I want to call your attention to the incision that has been made here It is the S shaped incision that has been developed in this clinic (Fig 6) It begins at the ensiform cartilage and curves down a little until it gets to the middle of the rectus and then is carried down over the middle of the rectus for 4 to 6 inches where it curves outward like an old fashioned letter S

We divide the skin and the superficial fascia Now I come down to the anterior sheath of the rectus I am dividing this over about the middle of the rectus parallel of course with the rectus fibers I come down to just above the umbilicus and shoot a little bit out following the curve of the S Now I take a blunt dissector like a Kocher and split the rectus I am not cutting the rectus I am splitting the rectus Doing this I get some little bleeding from the muscle branches in the rectus muscle That exposes the posterior sheath of the rectus The posterior sheath of the rectus is composed of the transversalis and half of the internal oblique I divide this posterior sheath and divide at the same time the peritoneum trying not to injure any of the important structures beneath This is almost the same length as my original incision

Now I find that this is the sort of a case that even the great surgeons when Keen and Musser made their report would have retreated from because in those early days they did not attempt to get out a gall bladder from such a mass of adhesions I find this gall bladder covered by this mass of omentum The gall bladder is distinctly enlarged The next step that will be necessary will be the separation of these adhesions from the gall bladder so that we can bring it into view I think we are going

to have a good deal of trouble separating them because they are so firm and so vascular. Beginning at the fundus of the gall-bladder I am trying to separate the adhesions by blunt dissection. Now it is possible that we may get into some pus while doing this. Now the gall-bladder comes into view. You see the liver. There is rather an excessive amount of hemorrhage here, mostly



Fig 6—Bevan S-shaped incision in its relation to the right rectus muscle. The nerve-supply to the muscle is depicted on the opposite side. Note the relation of the lower end of the incision to the umbilicus.

venous. We will wait just a few minutes until that venous hemorrhage ceases under the pressure of dry abdominal pads. It takes five or six minutes for coagulation to take place.

As I get rid of this omentum and intestine, I continue my dissection and find a big stone in the gall-bladder. Now I have a great big distended gall-bladder to deal with here. I do not know

what is in this gall bladder pus or mucus There I have opened into some pus The gall bladder is very friable This is clearly a case where it is necessary for us to remove the gall bladder The under surface of the liver is exposed The tissues are very vascular If I could I would take the gall bladder out from below Now I have the hemorrhage fairly well controlled It is from the under surface of the liver The gall bladder is full of pus and gall stones The hemorrhage is pretty well controlled by pressing a sponge in between the surface of the liver and the gall bladder and making a little tension I have gone down to the surface of this cystic duct which I have pretty well isolated I have put a clamp both on the cystic duct and cystic artery a clamp with a full curve that we have introduced in this clinic for this particular purpose (see Fig 2) Now I am going to take off that lower clamp and apply a catgut ligature

We have now removed the gall bladder and I think we have the hemorrhage controlled This is rather a trying case from the standpoint of the doctor and the standpoint of the patient Now we will watch for a minute to see if we have the hemorrhage controlled I am under the impression that a dry pad is better to stop hemorrhage A wet pad is better for peritoneal surfaces Now we will put in a Mikulicz pad That whole omentum is coming I do not want to remove it There will be two lessons in this for you First of all we will put in two cigarette drains because we want very good drainage We shall carry them down to the stump of the cystic duct Then in this large oozing cavity I will put in this iodoform gauze to control the hemorrhage

Now what will happen here? This woman will get well I think the risk is at least 5 per cent because the gall bladder was full of pus and because of the considerable hemorrhage that occurred during the operation What will happen will probably be that there will be a certain amount of primary wound secretion and possibly escape of bile There is no evidence of stones in the common duct There is a possibility of a general peritonitis because undoubtedly a certain amount of this pus was poured out in the space between the liver and the upper surface of the

colon. I am rather inclined to think that there is more danger of a localized peritonitis than a general peritonitis. I do not think there is one chance in twenty, however, of her having peritonitis. There is greater danger of fatal termination from pneumonia or some of the other postoperative lung complications which are responsible for most of the deaths after cholecystectomy. This might be either a lobar pneumonia, a bronchial pneumonia, or, in addition to the lung complications of that type, such a thing as a pulmonary embolism may develop and be the cause of death.

You might ask why I did not do a cholecystotomy instead of a cholecystectomy. My answer is that there would be a blocking up of the cystic duct and a permanent mucous fistula had I simply removed these stones.

The immediate after-treatment should be normal salt solution by rectum, intermittently, 10 to 12 ounces every three hours, and morphin, beginning with  $\frac{1}{4}$  grain and repeating in  $\frac{1}{8}$ - and  $\frac{1}{4}$ -grain doses hypodermically until the pain is controlled. In the normal course of events the stitches should be removed in ten or twelve days. One drainage-tube will be taken out in three or four days and the other a few days later, then a gradual removal of the gauze, so that it will all be out at the end of six or seven days. That should be done by softening the gauze with peroxid and removing a few inches at a time. One of my colleagues who was operated upon some time ago, and who had to have his wound packed with iodoform gauze, was wise enough to insist on a gas anesthesia when the gauze was pulled out. He had pulled out so much gauze and hurt so many patients that he knew how much pain it caused. I much prefer not to use such a gauze pack, but it was necessary in this case. A good big surface of the omentum larger than my hand was bleeding where we stripped it off from the gall-bladder.

To continue our discussion of the natural history of cholelithiasis: Another thing that often happens is that the patient goes to Carlsbad or some springs and lives on a moderate diet, takes more exercise, and the gall-stone attacks become very much less frequent. Hundreds of people, thousands of people go to Carlsbad every year to have their gall-stones cured. Now

we know that no chemical will dissolve gall stones inside the human body but it does happen under this kind of treatment, with more exercise limited diet, and moderate saline catharsis that the attacks become less frequent. This is the benefit of the so-called medicinal treatment. There is no doubt that it reduces the number of gall stone attacks in many cases but it does not cure gall stone disease. The gall stones remain latent.

The diagnosis of gall stone disease is made by the history of the attacks of hepatic colic the character of those attacks the character of the pain the location of the pain the radiation of the pain from the right upper quadrant to the back and to the right shoulder blade the tenderness and the location of the tenderness and the exclusion of other pathologic conditions such as duodenal ulcer kidney stone and chronic appendicitis that might give a similar picture. In the case of an obstruction of the cystic duct we may find as in this case a palpable gall bladder. In the case of an obstruction of the common duct—jaundice. In ball valve obstruction of the common duct—intermittent jaundice an attack of jaundice lasting a few days then disappearing because the ball valve stone floats up as the edema and inflammation of the mucosa disappears and allows the bile to pass. An impacted stone in the ampulla—a progressive jaundice a deepening jaundice. In all cases of stone in the hepatic duct—jaundice.

In jaundice of any type due to gall stone disease the development of a complication known as cholemia occurs. It is not uncommon for the jaundice cases to develop a chronic nephritis or a subacute nephritis and eventually coma and death. In a case of cholemia the simple operation of cholecystotomy under local anesthesia putting a tube into the dilated gall bladder and relieving the jaundice by draining the bile to the outside may be followed by death from a parenchymatous oozing from the mucous membrane of the gall bladder or an oozing from the line of incision. We all know that every surgeon has experienced a number of deaths from hemorrhage due to this tendency of cholemic patients to bleed—a symptomatic hemophilia. On this account we sometimes hesitate to operate upon a patient with jaundice.

Another condition that develops in the natural history of this condition is an associated infection of the pancreas. It occurs in cases where there is a stone in the common duct by an extension of the infection through the pancreatic ducts that open into the common duct and through the tissues of the pancreas itself, with resulting fat necrosis and hemorrhage and possibly the sloughing of the pancreas, or, if the process is chronic, to the formation of a chronic interstitial pancreatitis.

Another thing that may develop in the natural history of this condition is carcinoma, due to chronic irritation from the presence of gall-stones in the bile tract. I must say that it is not certain just what relationship gall-stones have to cancer of the bile-ducts, although surgeons accept the proposition that the chronic irritation of gall-stone disease may be an important factor in the development of carcinoma. In the natural history of this process we may have rupture of the gall-bladder, general peritonitis, and death.

One picture that may develop in these cases is that of gall-stone ileus, if you use the term "ileus" in the wide sense of the word. It can be of the mechanical type, the result, for instance, of a big stone ulcerating its way from the gall-bladder into the duodenum, and, second, of the paralytic type. A woman like the one who was just operated on may develop in the course of a gall-stone attack a definite ileus. She bloats up and the abdomen becomes tremendously distended. She cannot pass any gas from the rectum. There is usually a good deal of pain, and sometimes the process goes on to a fatal termination. The postmortem shows that death was due to paralytic ileus, the result of a localized peritonitis around the bile tracts, all this producing the same clinical picture that you find in connection with mechanical ileus, and not infrequently, as I have said, a fatal termination.

As a result of the experience we have had in this clinic with gall-stone surgery I would like to give you the following conclusions:

Whenever the diagnosis of gall-stone disease can be made with a reasonable degree of probability the patient should be given the benefit of surgical therapy except in a few



cases where, because of age or organic lesions, a surgical operation carries with it unusual and great risks. In such, good judgment may indicate medical management. Where the gall bladder is fairly normal without any thickening of its walls, and where there is no stone in the cystic duct, the operation of cholecystotomy may be selected. We are, however, doing more and more the operation of cholecystectomy—in probably 90 per cent of our cases—because in such an uncomfortable percentage of our cholecystotomies we have been required to do a secondary operation and remove the gall bladder. Our mortality in our cholecystotomies has been about 1 per cent. It has been a little higher, about 2 per cent, in the cholecystectomies but I believe that the mortality has been less in our primary cholecystectomies than in the cases where we have done cholecystotomies if we add the mortality from the secondary operations that have been required. When the stones are in the cystic duct a cholecystectomy is always indicated. With stones in the common duct the usual direct choledochotomy should be performed with thorough drainage continued as a rule, for at least ten days. In the small number of cases where the stone is impacted in the ampulla a transduodenal choledochotomy, as suggested by McBurney, should be performed. The mortality in the common duct cases is probably somewhere from 5 to 10 per cent. There are a few cases of gall stone disease associated with chronic interstitial pancreatitis where a cholecystenterostomy may be indicated. And finally, we should insist upon a very wide exposure of the field, which will enable us to do our work thoroughly and easily, and give us such complete access to the bile tracts that there will be little chance of our overlooking a stone in the cystic or common ducts—an accident which unfortunately, so frequently happens in operations done without sufficient exposure and careful search.

## GENERAL PRINCIPLES OF THE OPERATIVE CURE OF INGUINAL, FEMORAL, AND DIAPHRAGMATIC HERNIAS DEMONSTRATION OF THREE CASES

*Summary* Frequency of hernia outline of the development of the modern operation the methods of Czerny Wölfler Bassini and Andrews and the indications for each transplantation of fascia rarely desirable the anatomy of inguinal hernia precautions—danger of pulmonary infarcts bronchitis and pneumonia choice of suture material—sil or wire a failure—catgut the best—stitches should approximate not strangulate tissues place of the local anesthetic—technic of its use—its necessity in cases of strangulated hernia—twenty five operations under apothesine etiology of hernia—the preformed sac the anatomy and operative cure of femoral hernia diaphragmatic hernia—diagnosis and cure

*October 12, 1916*

WE happen to have 2 cases of hernia which we shall operate upon this morning one a femoral hernia and one an inguinal hernia We shall do the femoral hernia, because of the man's condition under local anesthesia He has an old emphysema and a heart lesion which make a general anesthetic contra indicated We shall do the inguinal hernia under a general anesthetic

I want to give you a rather brief sketch of the subject of hernia In the first place hernia is exceptionally common Macready, from the study of a large number of statistics came to the conclusion that hernia occurs in about 12 per cent of the males and in about 2 per cent of the females that is about one man out of eight some time in his life has a rupture and about one woman out of fifty Thus of course includes all varieties of hernia The common forms as you know, are due to congenital defects at three weak points in the abdominal wall—the inguinal region the femoral region and the umbilical region The other forms of hernia such as obturator sciatic hernia of the linea alba diaphragmatic hernia and postoperative hernia are comparatively rare when we compare them with the common forms Now inguinal hernia is the hernia of the male, femoral hernia is very often regarded as the hernia of the female, and yet a careful study of

statistics shows that inguinal hernia is more common in both male and female. In other words we have really an enormous percentage of inguinal hernia in the male as compared with the female. In the female femoral hernias are comparatively more common than in the male but the total of inguinal hernias in the female outnumbers those of the femoral. The umbilical hernias outside of those that occur in children are much more common in the female than in the male.

I want to give you a very brief outline of the history of hernia from the standpoint of the modern operation for its cure. Until 1878 no operations were done for the radical cure of hernia that could be regarded in any way as successful. A number of methods had been employed up to 1878 such as subcutaneous wire suture of the sac or the injection of some irritating substance into the sac like tincture of white oak bark with the idea of producing an obliterative inflammation. Of course long before that period thousands of hernias had been operated upon for strangulation but I am referring now to the operation for the radical cure of hernia. In 1878 Czerny who died the other day in Heidelberg and who was an assistant of Billroth devised an operation for the cure of hernia which consists in cutting down upon the hernia isolating ligating and removing the sac and then suturing up the external ring. That was the first step. The second step was invented by Wolfier. Wolfier split up the external oblique which covered in and was in front of the inguinal canal an operation which he called the *Kanalschnitt*. He added to the work that Czerny had done (simply isolating the sac ligating it removing it and sewing up the external ring) the procedure of removing the sac high up at the internal ring and sewing up the canal thus obliterating the canal from the internal ring to the external ring. In 1886 Bassini published an operation which he had been doing for several years and which was the next great step in advance in hernia work. He added to what Czerny and Wolfier had done the elevation of the cord from the canal closing the canal under the cord and then putting the cord down over the closed canal and closing the other structures the external oblique and superficial tissues over this displaced cord. Wolfier added also another

very important step in the development of hernia, that was to provide for special protection in very large openings by transplanting the rectus muscle and the rectus sheath. Now I will draw these various steps on the board.

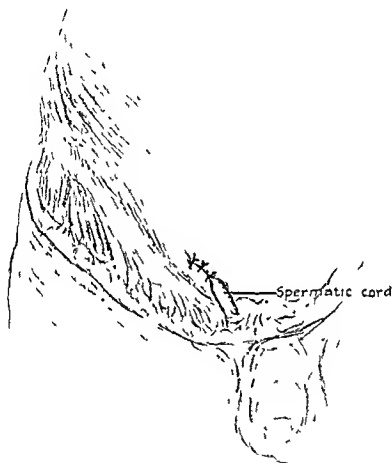


Fig 7—Czerny's operation Sac cut off and external ring closed by suture

Here is the abdomen; here is Poupart's ligament Czerny's operation was simply ligating off and removing the sac at the external ring when this was tied, so that he left simply a stump at that point Then the ring was closed with suture (Fig 7) Now the next step, Wolfler's "Kanalschnitt," was to split up the external oblique from the external ring to the internal ring and then to remove the sac high up at the internal ring The canal

was closed by sewing the internal oblique and transversalis to Poupart's ligament over the cord (Fig 8) Then the Bassini step was to elevate the cord with a blunt hook and close the canal under the cord (Fig 9)

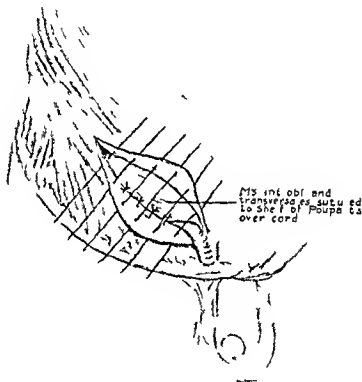


Fig 8—Wolffers Kanalchnitt operation

Now the next important step was Wolffers second operation which was this Here is the rectus muscle coming down in this way on this side Wolffers found in very large hernias that he was apt to have recurrences so in addition to the steps that I have just described he would split open the sheath of the rectus muscle by an incision there and then he would pull out the muscle

like this and sew the rectus muscle to the shelf of Poupart's ligament (Fig 10)

The next step which has been of value is that of the imbrication or overlapping of tissues (Fig 11) That was done independently by a number of men—Lucas Championnière, Girard,

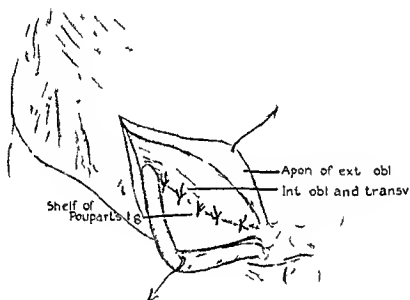


Fig 9—Brissini operation Transplantation of cord and suture of internal oblique and transversalis muscles to the shelf of Poupart's ligament

and Wyllys Andrews of this city There you have very briefly presented the various steps that have gone to make up the modern hernial work Czerny's simple work, in 1878, of removing the sac and sewing up the external ring, Wolfier's work, a few years later, of splitting up the canal, removing the sac at the internal ring, and sewing up the canal, Brissini's work of elevating

the cord and closing the canal under the cord, Wölfler's plan of closing the rectus muscle in large hernias in order to fill that defect, then the process of imbrication or overlapping the various

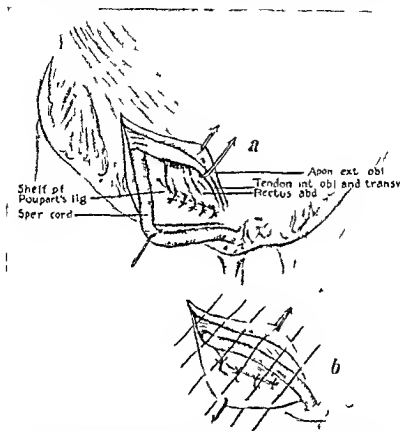


Fig 10—Wölfler's operation for closure of large hernial openings *a* Rectus muscle sutured to the shelf of Poupart's ligament *b* internal oblique and transversalis muscles sutured to Poupart's ligament The cord has been transplanted and the anterior wall of the new inguinal canal is about to be formed by the closure of the incision in the aponeurosis of the external oblique

layers in order to give strength I want to say that you have here all that is of value in hernial work There have been hundreds of men who have entered this field and suggested improvements There have been dozens of other plans suggested such as the

work of Macewen, which for a time attracted a great deal of attention, the work of Kocher of elevating the sac, twisting it high up, which is still done in Kocher's clinic and a few other clinics, the transplantation of fascia, which has been done away with because of the more satisfactory transplantation of the rectus

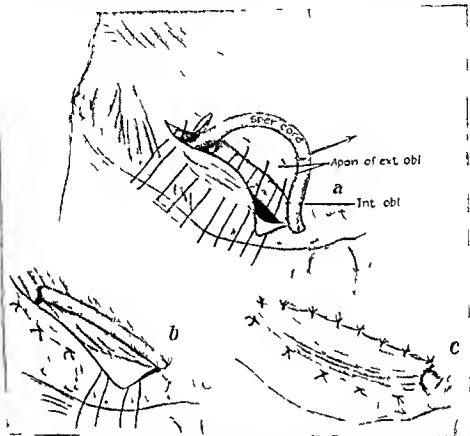


Fig 11—Andrews' imbrication method *a*, Cord elevated and sutures placed in the first step in the actual imbrication, *b*, the suture of the superior edge of the incision in the external oblique aponeurosis to Poupart's ligament to form the posterior wall of the new inguinal canal. Note the notch in that aponeurosis near the upper angle of the incision for the reception of the cord, *c*, sutures tied and cord dropped into position, *c*, flap of external oblique aponeurosis stitched over spermatic cord to complete the new inguinal canal

muscle and rectus sheath, the filling in of large hernial defects with filigree wire, putting into the hernial defect silver wire, like the wire-screen we have to protect the windows against flies and mosquitoes, with the idea that this foreign body would form a bulwark of value in large hernial defects, etc



Another thing I want to mention very briefly is the sutures that have been used in hernia. Early silver wire was used then some men became very enthusiastic about kangaroo tendon. Some men still bury silk in hernia. Some operators did very poor work in connection with hernia by using a lot of silver wire. They thought for a time that it was much the best procedure. They said they seldom saw the silver wire work out in the further history of the case but other surgeons saw many of their cases and had to remove the silver wire. We gradually came back to the rather simple proposition of catgut. That was reliable that could be depended upon. For a time chromicized gut was used a good deal because it was supposed to last longer in the tissues than ordinary catgut and so was more desirable. Gradually however we learned that any good catgut such as iodine catgut lasts long enough that is until wound healing is complete and so practically all over the world today catgut is the suture that is employed in hernial work.

In regard to the anesthetic. Hernias have been very generally done under general anesthesia in the past. The majority of hernias are possibly best done under general anesthesia. Since the introduction of cocaine a good many efforts have been made to do hernial work under local anesthesia. Harvey Cushing Professor of Surgery at Harvard but then associate in surgery at Johns Hopkins devised a very good technic for hernial surgery with cocaine early in the history of local anesthetics. At that time I did 50 or more hernias under cocaine infiltration anesthesia. Cocaine had the objection of great toxicity in certain cases. A number of sudden deaths followed the use of cocaine as a local anesthetic it did not prove entirely satisfactory and so was very generally discarded. With the introduction of novocaine we found an anesthetic about one eighth as toxic as cocaine and which with the addition of adrenalin produced very satisfactory local anesthesia and today we preach the doctrine that as far as the anesthetics are concerned the ordinary hernia where the patient is a good surgical risk can be done either under ether or under a local anesthetic. Strangulated hernias should all be done under local anesthesia. I shall elaborate upon that point later on.

## OPERATION

Now for a moment we shall discontinue this general discussion and operate on this case of inguinal hernia. Our object is to expose the inguinal canal. The landmark is the external ring in which I have my finger. Now I shall make the incision from the external ring upward and outward, on a line with a point about an inch medially from the anterosuperior spine and parallel to Poupart's ligament. You should know your geography here very well. It is not sufficient to do what an old Rush graduate once told us he used to do when he was practising in northern Minnesota before the days of radical cure, when he operated on a strangulated hernia. He said he used to cut down through the skin and superficial fascia and then damn carefully until he got to the gut. That was the extent of his anatomy. That will not do. You want to know the anatomy and know it thoroughly.

Our incision penetrates first the skin and superficial fascia. Here we come to some vessels in the superficial fascia which are branches of the femoral artery and vein. You can ligate these or else you can simply clamp them. These three vessels are the superficial epigastric, the superficial external pubic, and the superficial circumflex iliac. We have only divided two of them here. Now we divide down to the external oblique. With three retractors we will expose this field. Here is the external ring. I have my finger in it now. We will divide the tissues over the external ring pretty well parallel to the fibers of the external oblique. I want to call your attention to the structures that come into view. That white structure on my forceps, about the size of a good size fiddle-string, is the ilio-inguinal nerve just beneath the external oblique. We leave it alone. It is not very important, but it is well not to interfere with the innervation of this region. Now I pick up the upper flap of the external oblique; I shall turn it back and expose the internal oblique. Then we take the other fold of tissue (the external oblique fascia below the incision) and follow it down to Poupart's ligament. That fine silver-like structure is Poupart's ligament. I expose the shelf of Poupart's ligament. The next step will be the division of the two layers of fascia that are common to the sac and to the cord.

Those are the cremasteric fascia and muscle and the transversalis fascia. They are rather fine structures. I am dividing now the cremasteric fascia and muscle and the transversalis and as I divide them we will bring into view the sac. It is the white fibrous tissue that is on the sponge now. I can wipe this sac off from the structures of the cord which are the spermatic cord and the remnants of these layers of fascia which we have just divided. I will do this slowly. The vas comes into view. See this white structure on my finger now. That is the vas. You want to be careful about any injury to the vas for the vas in this case is very intimately associated with the sac. Now then we have separated the sac from the cord and can proceed to open it. You see I can pass this grooved director right into the sac and into the abdominal cavity. It is a very small sac and nothing came out here except a little strand of omentum. The patient had a good deal of pain from a partial strangulation a short time ago. With the hemostats holding it open we now transfix the sac, ligate it and cut it off leaving a stump about  $\frac{1}{2}$  inch in length. Now the sac has been disposed of. So far we have done nothing but what Wolfier did way back in the early eighties and I do not believe any further dissection will be necessary in this case. We will simply do the operation of closing the canal replacing the cord in its normal position. Now let me caution you to use very great care in exposing this cord because not infrequently after hernia operation you get a lung infarct. How does a lung infarct occur? A lung infarct occurs as the result of thrombosis in some of the spermatic veins usually from rough handling or infection. It goes through the general circulation to the heart then through the pulmonary artery to the lung and sometimes a fatal pulmonary embolism results. Lung infarcts are very common after hernia operations.

Now I pick up a good  $\frac{1}{2}$  inch of this red muscle and sew it to the shelf of Poupart's ligament. Now watch me tie this suture. I do not tie it tight. I do not want to cut through the muscle. I simply want to bring the muscle up snugly to Poupart's ligament. I do not want to strangulate it like you cut off a hemorrhoid with a ligature. Now I pick up again a good  $\frac{1}{2}$  inch of

this muscle and again the shelf of Poupart's, and with three or four stitches we can close this canal very nicely. I think that will be enough. I have only put in three. We have a very small hernia to deal with. Now the next step will be sewing up the external oblique. You see this is a very simple operation, but it is one that will be very efficient in this particular case. Now the external oblique is sewed up. Remember that the superficial fascia here is a vascular layer, and in order to get that vascular layer well over your line of incision put in a couple of very fine buried catgut sutures through the superficial fascia. Now we look and see if there is any bleeding. There is some bleeding here. We will ligate that one point so as to have the wound perfectly dry.

We are attempting to put the skin stitches in pretty evenly and without tension. There is one thing you want to learn in abdominal surgery and all other kinds of surgery, that is, that stitches are put in to approximate and not to strangulate tissues. It is a very difficult thing to get men to put in stitches properly. Most everybody wants to pull them tight. Sometimes, of course, in surgery, when you want to control bleeding, it is important to pull a stitch tight.

The wound will be dressed with a simple dry dressing and a good spica bandage. There is no objection to having that man sit up tomorrow if he wants to and no objection to having him stand up tonight and urinate or get on a commode to urinate. He will probably have a little ether nausea and a few gas pains. If this heals perfectly, as we expect it will, the stitches will be taken out on the eighth day and he will leave the hospital the ninth or tenth.

#### REMARKS

Now as regards the fate of the catgut. The catgut will last twenty days, long enough for wound healing to be completed, and then it will be absorbed. There are some risks in this operation. The risk of the general anesthetic is probably 1 in somewhere from 5000 or 10,000 if the man is a good surgical risk. The main complications that we have found have been the lung complications, and these occur probably in 2 per cent. of the cases. Prob-

ably one man out of fifty with a perfectly straight hernia will have some lung complication, either an infarct, a bronchitis or a pneumonia. Immediately after the operation the one thing you want especially to look after is the patient's urinating. Many of these patients cannot urinate if they lie in bed. Most of them can urinate if you allow them to stand up. It is desirable not to allow the bladders to become overdistended, necessitating the use of the catheter. The catheter always carries with it a certain amount of risk of a cystitis.

The percentage of cures in a case like this would be very high probably 99 men out of 100 with an operation of this kind would be cured permanently of the hernia. That percentage would not hold if applied to all sorts of hernias. Taking it all in all, we are curing about 19 out of 20 hernias that come to the clinic by operation. That however, would necessitate your adopting proper methods in each case. In simple cases simply removing the sac and sewing up the canal will suffice, in difficult cases with large openings a more complete operation, such as the Bassini transplantation of the cord the imbrication method or Wolfier's transplantation of the rectus. In cases with large rings, either a hernia of the direct type, where the internal ring is immediately behind the external or in what Gunn used to call a straight hernia, which is a large oblique inguinal hernia that has lasted so long that the internal ring had been carried down opposite the external ring the transplantation of the rectus is necessary in order to secure a good result.

Returning to the general discussion of hernia I want to emphasize one point that has been brought out in the last few years in regard to the etiology. The important factor in the occurrence of hernia is a preformed hernial sac a congenitally existing hernial sac. Now that is true whether the hernia is inguinal, femoral or umbilical. For a long time we used to believe that these hernial sacs were produced by the hernia coming down through its weakened opening. That is no longer accepted. An Australian by the name of Russell a few years ago first called our attention to the fact that in most inguinal hernias and in most femoral hernias long before the hernia occurred there was a peritoneal sac pro

jecting through the canal. Let me give you an illustration: A man of twenty-five in perfectly good health and an athlete has never had a hernia. He goes to stool one morning and strains because his bowels are very much constipated, and all of a sudden he has a very violent and severe pain in his right groin, he looks down and sees a big swelling in his groin, running down into his scrotum. A surgeon is called and finds he has a large inguinal hernia which has apparently suddenly developed. He cannot reduce it and puts the patient under ether and operates, opens up the hernia, and finds 20 inches of the small intestine and some omentum down through the canal and in the scrotum and a large peritoneal sac. Now that peritoneal sac did not develop the instant this man was at stool and pushed this inguinal hernia down. That sac was there before. That sac was there before with a rather contracted, small neck. Under the pressure of the straining at stool that contracted neck was opened up and out shot into the sac 20 inches of the small intestine. That is the picture of a hernia and a pre-existing peritoneal sac. We know now, because our attention has been called to this fact, that a careful dissection will show in a large number of cadavers without any hernia these pre-existing small peritoneal sacs in the inguinal region, in the femoral region, and in the umbilical region. We know from our study of undescended testes, and we have operated upon about 300 cases of undescended testes, that even when the testicle has never been out of the abdomen and there is no hernia, we find a long peritoneal pouch preceding the testicle and passing through the canal down to or into the scrotum. In other words, the old belief that the testes brought down the peritoneal pouch into this position is erroneous. The peritoneal pouch is a pre-existing pouch.

## CASE II

This patient is an old German who has a femoral hernia. We will operate under local anesthesia. Novocain, which is a German preparation, is no longer on the market, and we are using apothesine, a synthetic preparation made in America, which we have found to be quite as satisfactory if not more so than the German preparation. Usually I tell these patients that a hernia can be

done under a local anesthetic with much less discomfort than having an ordinary tooth filled. Sometimes I tell the patients in operations about the face where we can control the entire field perfectly that I will promise them, outside of the first injection it will not hurt any more than having a shave. There is no sensation in the infiltrated area. The pulling and pressure makes pain in the surrounding structures, and one has to handle these structures with great care to prevent any pulling that can be transmitted to the underlying sensitive structures.

**The armamentarium.** First of all a very fine hypodermic needle the ordinary morphin needle and syringe is used to infiltrate a small area, and then a larger syringe and needle can be painlessly used to complete the infiltration. We will surround this entire field with a hollow sphere of infiltrated tissue. You see the infiltration progresses. Can you see it go on? Now we can make this incision if it is a femoral hernia either vertical and parallel with saphenous vein or as preferred in many cases, parallel and just below Poupart's ligament. The strength of this solution is  $\frac{1}{2}$  of 1 per cent and about  $\frac{1}{100,000}$  of adrenalin the same as novocain.

Now we divide through the skin and superficial fascia and we come in contact with the same vessels we did in the inguinal hernia, the superficial circumflex iliac, the superficial external pubic, and the superficial epigastric, coming up through the cribriform fascia. The patient says he has no pain. Now in the pulling of this sac there will be a certain amount of pain. The technic under local has got to be carried out with a great deal more care than in a general anesthetic. Here is a great vein right in our way and we will ligate and divide it. That is the internal saphenous vein. You see gradually there comes into view a mass of fat projecting from the femoral ring. Now we have our whole hernial sac pretty well isolated and very much the same picture that we had in the femoral hernia we operated the other day. There is the fat. That is the main mass. It is pretty hard to see the sac. It is so thin. It will be rather interesting for you to make a study of the tissues to see what this fat is. Now there is fat and fat and there are a number of kinds of fat. I cannot even

tell you yet whether that fat is subperitoneal fat or whether it is omentum. We will investigate it a little farther and see definitely. I am rather inclined to think it is omentum—at any rate we do not want to injure anything in here. There is some structure that I do not quite understand, some structure here right in the middle of the sac. Every once in a while you get a piece of bladder or of intestine in such a hernia. Here in the center of this fat is a peritoneal sac, a little pouch that I have opened now. I have this grooved director leading into the peritoneal cavity and I have four forceps on the sac. We ligate the pouch very high up and leave about  $\frac{1}{4}$  inch of the stump distal to the ligature. Then we shove that stump right under and above Poupart's ligament. Now, you see, all this fat is subperitoneal fat.

I will put just one mattress stitch here. I want to be sure not to put that stitch through the femoral vein or through the femoral artery. There is the femoral ring. There is the pectineus muscle and there is Poupart's ligament. Now this stitch goes through Poupart's and through the pectineus fascia, and when tied it obliterates the ring (Fig. 12). The third step of the operation will be simply closing the skin wound. The sac is gone. Everybody knows that in a hernia there are two abnormal conditions—a peritoneal sac and a hole. You remove the sac and sew up the hole. Sometimes the hole is more like a canal, as in the inguinal region. Sometimes it is more like a hole. Here it is so short that you simply have to put in one mattress stitch for closure.

I want to emphasize the importance of the anatomy involved in this little operation. You see we made the incision parallel to Poupart's ligament, and we went through the three superficial branches of the vein and the artery and come down to the cribriform fascia. Then we came to a thin layer of fascia covering some fat. That fat here was not omentum, though it looked very much like it. It was subperitoneal fat. Right in the middle of the wound, looking like the ordinary peritoneum but very much thickened, was the hernial sac proper.

Now, you see, the patient has stood the operation very well. We have taken plenty of time on account of this demonstration.



The wound will be closed with one or two superficial catgut sutures and then the skin will be drawn together nicely with silk. The patient tells me he has had no pain during the operation. Thus apothesine is working out quite as well as novocain and personally I am very grateful to the American chemists who are making

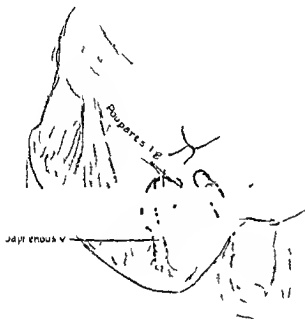


Fig 12 — Mattress suture of catgut between pectineal fascia and muscles and Poupart's ligament. When this suture is drawn taut the femoral ring will be obliterated.

us independent of Germany or any other foreign market for the drugs that we have to use in medicine. You know we are now getting a very good substitute for salvarsan in this country. Here is another example showing that it is possible to make synthetics like novocain in America. After the war is over it will

simply be a trade war as to who will furnish the best preparations at the most reasonable price. Practically all the synthetics that have been heretofore made in Germany are now being made over here.

I have recently used apothesine in 25 operations, including removal of inguinal glands, resection of rib and draining of lung abscess, circumcision, inguinal and femoral hernia, carcinoma of the face, synovial cyst on the back of the wrist, ligation of thyroid vessels, gastro-enterostomy, resection of rib and draining sub-phrenic abscess, a very extensive thyroidectomy, removal of bullet from the thigh, removal of infected cyst of neck, and removal of tumor of the breast. We have used as large an amount as 5 ounces of  $\frac{1}{2}$  of 1 per cent. solution. We have not noticed any toxic effects of any kind and no interference with primary wound healing.

I understand that the agent is being employed by one hundred surgeons in different parts of the country and that it will not be placed on the market until the experience of these men with the agent has been fully reported. My own experience with apothesine seems to point to its being a very satisfactory local anesthetic which meets the necessary requirements of being non-toxic, of not being decomposed by boiling for five or ten minutes, and of producing complete anesthesia which lasts in the neighborhood of an hour.

In regard to the after-treatment there is very little to be said. This patient will have his luncheon. It is now twenty-five minutes of 1. He will have his luncheon at 1 o'clock if he wishes it. I must say that I feel this way about the use of local anesthetics in operations. If I personally had a very serious operation, as an abdominal operation that required relaxation, I should have the surgeon do the operation under the best conditions and, in order that he would not be hampered by the movements of the patient or the rigidity of the muscles, I would take a general anesthetic, a straight ether anesthetic, drop ether. If I were to have an operation done on a strangulated hernia for myself I would insist that a local anesthetic be used. I want to come back and dwell on this point for a moment, because it is in many ways the most impor-

tant point I am presenting to you this morning In the case of a strangulated hernia you have many complications to contend with One is shock Often the patient has great shock A more important complication is vomiting One of the constant or almost constant accompaniments of strangulated hernia is vomiting Vomiting carries with it in this case sometimes a peculiar danger I have seen patients die on the table in the hands of an expert anesthetist by drowning them selves in cases of strangulated hernias that had existed for some time where the stomach and entire alimentary tract were full of fluid material Shortly after the first profound anesthesia the vomitus just pours out not pints but quarts of material from the stomach from the intestinal tract and the patient actually drowns on the table In the same way patients that are operated upon for strangulated hernia may not drown on the table but they drown after they are put to bed or they may get an aspiration pneumonia Now because of these facts local anesthesia is peculiarly indicated in cases of strangulated hernia I want every one of my pupils who does any surgery unless we have some other means presented to us of greater value to use in strangulated hernias a local anesthetic I have gone so far as to say that it is not good surgery to use a general anesthetic in cases of strangulated hernia Now again this man you see stands his operation very well He has hardly turned a hair to use a common expression during the operation I think we hurt him once slightly when we pulled up that mass of fat with the peritoneum in it because we made traction on the peritoneum The local anesthetic I should say should be used in quite a proportion of hernias and as a rule now I take the position of using it always in strangulation or in any serious lesion where your patient is a bad surgical risk and then the other cases I would leave open to the patient You cannot very well operate on a child with a local anesthetic You must have the co-operation of your patient You cannot very well operate on a hysteric patient with a local anesthetic but as a general proposition I submit the facts to the patients and let them choose between a local and general anesthetic if they are ordinary good surgical risks I want to say that some patients

are profoundly impressed with the value of a local anesthetic. Not very long ago we had a very well-to do patient in the hospital who had a great dread of having his umbilical hernia operated on under general anesthesia. He came down here and was operated under local. You can do a beautiful umbilical hernia operation

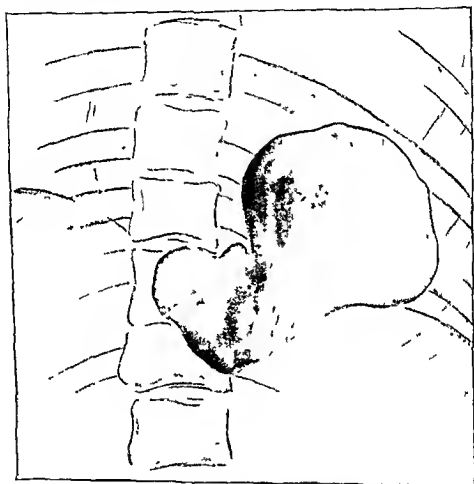


Fig 13 —Diaphragmatic hernia Sketch of x ray plate before operation. Note the large shadow lying above the diaphragm

under local with practically no sensation to the patient. He was so delighted with the result that a couple of days after the operation he called me into his room and gave me a check for \$5000 for the surgical department of the hospital, saying, "I want to express my great appreciation for the way the hospital has taken care of me." I simply cite that to show you that

individuals are very appreciative of good work done under local anesthesia.

### CASE III

As one of the rarer forms of hernia I shall now show you a case of diaphragmatic hernia recently operated upon

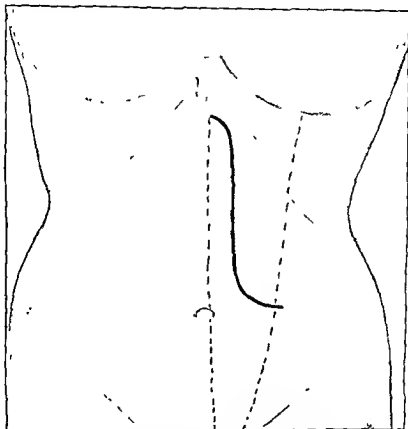


Fig 14 —Diagram showing S shaped incision for gall-bladder work adapted for use to the left of the median line

This lady, of about forty-five, had some very acute, severe attacks of pain in the region of the stomach. These would come on at irregular intervals some time after eating, would increase in severity for an hour or more, and would then be relieved by vomiting. She had consulted a number of physicians, and the diag-

nosis remained obscure until she came to see Dr. Bertram W. Sippy, who, after analyzing the facts, was able to make the definite diagnosis of a diaphragmatic hernia in which one-half or possibly more of the stomach passed through an opening in the diaphragm into the thoracic cavity. This was beautifully shown by x-ray plates taken after the patient had swallowed a bismuth meal, as shown in Fig 13. Dr. Sippy asked me to see the case with him, and we finally decided upon an operation.

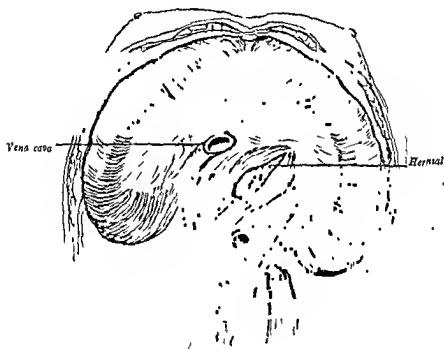


Fig. 15 — Diagram showing position of hernial opening and its relation to the aorta, vena cava, and esophagus

The operation was done under ether anesthesia and I made a large S-shaped incision through the left rectus muscle, such as I employ in the right rectus muscle for extensive bile-tract operations. This S-shaped incision in the left rectus is shown in Fig. 14. On opening the peritoneal cavity and making a wide exposure of the left upper quadrant, I found that about one-half of the stomach had passed into the thoracic cavity through an

opening which proved to be an abnormally large esophageal opening, or rather an opening in front of the normal esophageal open-

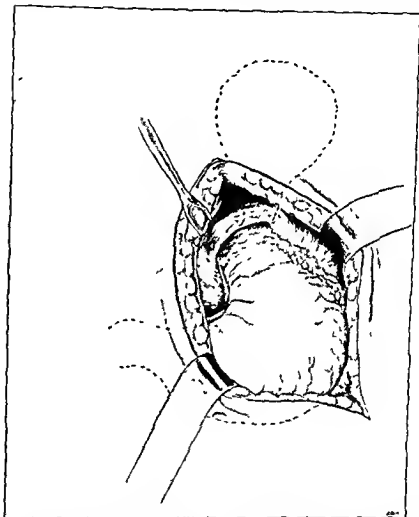


Fig 16—Diaphragmatic hernia About one-third of the stomach with a portion of the omentum is in the thoracic cavity

ing, as shown in Figs 15 and 16 Without much difficulty the portion of the stomach in the thoracic cavity was pulled down into the abdominal cavity and the opening in the diaphragm was

sewed together with catgut sutures, as shown in Fig 17. In order to insure further against recurrence the stomach was sutured to the diaphragm by a number of sutures, as shown in Fig 18. The external incision was then closed without any drainage and

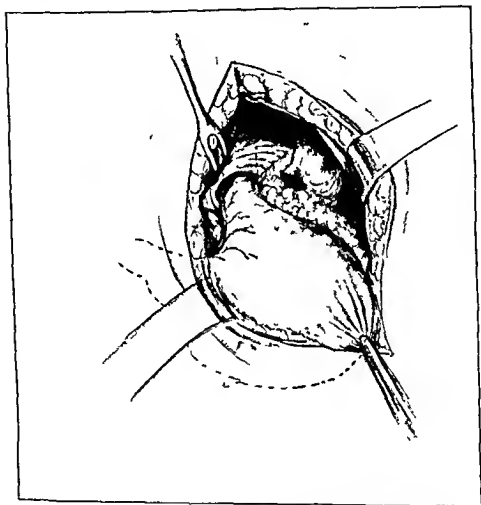


Fig 17 —Hernia reduced and the opening in the diaphragm closed by suture

the patient went on to an uninterrupted recovery from the operation.

The after-history was most satisfactory—a hismuth meal showed the stomach in its normal position below the diaphragm, as in Fig 19, and since the operation she has had no recurrence of her old attacks.



I am demonstrating this case especially to emphasize the fact that these diaphragmatic *hernias* of the stomach do occur that they can be diagnosed definitely by *x* ray plates taken with the stomach full of a bismuth or barium meal and I want also to

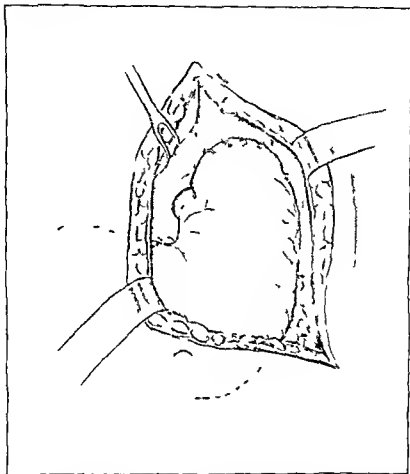


Fig 18 —Stomach sewed to diaphragm around hernial opening to insure against recurrence

emphasize the importance of the **S** shaped incision as described above through the middle of the left rectus in obtaining a very good exposure enabling the surgeon to make the necessary repair without difficulty

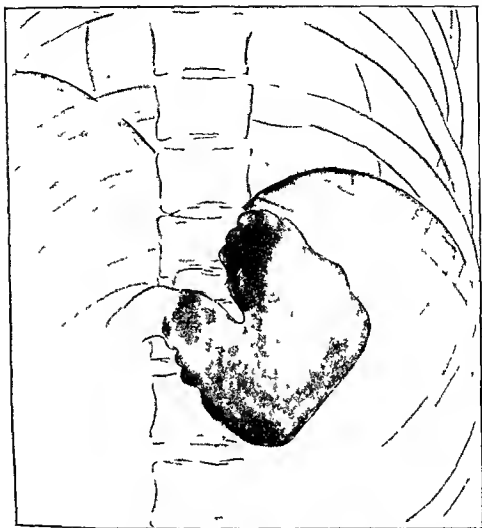


Fig 19—Sketch of x ray plate after operation Note that the barium shadow is now entirely subdiaphragmatic



# CLINIC OF DR A J OCHSNER

## AUGUSTANA HOSPITAL

### GOITER

#### The Indications For and the Technic of the Surgical Treatment of Goiter, Illustrated by Three Cases

##### *Summary of the three cases*

Case I —Progressive growth of an adolescent goiter greatly influenced by the menstrual periods in a girl of twenty four years Medical treatment of no avail Anesthesia in thyroidectomy Family history of goiter

Case II —Exophthalmic goiter Technic of operation Infected tonsils and goiter

Case III —Exophthalmic goiter A study of the pulse during the operation After treatment of surgical cases

#### CASE I

*October, 1916*

**Clinical History of the Patient**—A young girl twenty four years of age, was admitted to the hospital on October 18 1916 There have been several goiters in the family Her mother, her mother's mother, and her six sisters, all of whom are living all have goiters The goiters are all large nodular ones and none of them have produced symptoms requiring surgical treatment Her mother's goiter did not begin to develop until the age of forty two years after the birth of her last child The mother has become somewhat nervous and excitable during the past year (she is now forty six years old) but since she is passing through her menopause this trouble is probably due to the menopause The family has always lived near Lake Michigan

**Past History**—The patient had scarlet fever at two years and typhoid fever at seven years of age There was an abscess in the left eye when four years of age, which has caused total blindness of that eye At present she wears an artificial shell eye Her menses began at thirteen years, are regular, with but slight

backache the first day, and the flow is somewhat scant. The last period was on September 20, 1916.

**Present Complaint**—At the age of thirteen when she first menstruated, there was noticed an enlargement of the right side of the neck. There were no other symptoms. At each menstrual period there has been a sensation of fulness and swelling in the neck and the tumor has grown somewhat larger each month. During the past year the left side of the neck has grown larger and she has experienced sensations of choking and some difficulty in swallowing especially pronounced at the time of her menses. She has never been nervous or excitable and has no cough. She never feels the beating of her heart except after undue excitement and she does not think her pulse ever becomes rapid. The vision in the good eye is unimpaired. Otherwise she is quite well.

**Physical Examination**—The left eye is markedly shrunken and the cornea is entirely sclerosed. There is no sense of light or dark.

**Neck**—There is a very marked diffuse enlargement of all lobes of the thyroid gland. The right lobe is the largest and is 9 cm long and 7 cm wide. There is a little difficulty in breathing.

**Comments**—DR OCHSNER. This patient has had efficient medical treatment during the past two years during which the goiter has progressively increased in size. Because of this fact and because she is past the age of puberty and is beginning to have pressure symptoms we have decided to remove this goiter. Her reason for wishing to have it removed is that it is large and unsightly and interferes with her breathing.

She was given  $\frac{1}{4}$  grain of morphin and  $\frac{1}{16}$  grain of atropin hypodermically one-half hour before beginning the anesthetic. We do this so as to reduce the amount of anesthetic to be given to a minimum because the morphin will overcome the sensitiveness of the patient so that she will not feel our manipulations and the atropin will prevent her from inhaling mucus which would otherwise accumulate in the pharynx. That is of great advantage first in preventing her from coughing during the operation and in the second place it prevents pneumonia following the opera-

tion. The anesthetic is given until the patient is absolutely asleep and she is kept in the recumbent position during all this time. After the patient is deeply asleep, the head of the table is elevated to an angle of 45 degrees, so as to produce an anemia of the brain; that will serve to make what anesthetic she has received effectual during the operation. We will not have to give further anesthetic during the time that the operation is in progress. By the time the operation has been completed the patient will have exhaled practically all the anesthetic that has been given, and when the table is lowered the patient will be wide awake and all the effects of the anesthetic will be over. Also the worry of a possible postoperative pneumonia will be over. Since we have followed this plan in over 500 cases we have not had one case of pneumonia following a thyroidectomy.

NOTE.—Through Kocher's transverse collar incision, three-fourths of all lobes of the thyroid gland were removed by the method described in the next case. It proved to be a large diffuse colloid adenoma with areas of hemorrhage and fatty degeneration. The patient was permitted to sit up in bed directly after returning to her room and to sit out of bed in an easy chair on the following day. There was an uneventful recovery and the patient left the hospital on the twelfth day after the operation.

## CASE II.—EXOPHTHALMIC GOITER

The patient, a married woman of thirty-seven years, was admitted to the hospital September 13, 1916, because of goiter.

One brother has pulmonary tuberculosis; the family history is otherwise negative. She had measles and whooping-cough in infancy. She had an abscess in the region of the coccyx, which lasted two weeks and had to be lanced. Menstruation began at fourteen, very irregular, two weeks between periods, as a rule. She has been married ten years. Has never borne children or been pregnant. Her husband is well. She sleeps and eats well. Bowels are constipated. She drinks tea but no coffee.

She comes to the hospital because of enlargement of the throat and difficulty in breathing. Four years ago she first noticed that the neck was enlarged. She has been very nervous for

the past four years but worse the last six months. She gets out of breath easily but has noticed no palpitation of the heart. She has quite a tremor of the hands but no exophthalmos.

**Physical Examination**—The patient is a well developed poorly nourished woman. Face is flushed. There is no icterus. She is very nervous and excitable. There is no exophthalmos. There is a marked tremor of the protruding tongue. Both tonsils are markedly hypertrophied and cryptic and several necrotic stumps of teeth are present. There is a moderate solid enlargement of the left and middle lobes of the thyroid gland and a slight enlargement of the right lobe. There is a slight thrill felt over the tumor. Lungs and breasts are negative. Heart rate is 108. The sounds are regular and the heart is not enlarged. The abdomen is negative.

**Comments**—DR OCHSNER (Sept 13 1916) This patient is a bad risk and I am not going to wear gloves so that I may be able to do the operation as quickly as possible. A half hour before the anesthetic was given this patient received  $\frac{1}{4}$  grain of morphin and  $\frac{1}{16}$  grain of atropin hypodermically. She has been thoroughly anesthetized with ether and then the head of the table was elevated.

We always use the transverse collar incision of Kocher (Fig 20) because that makes an imperceptible wound that the patient can very easily cover up with a little string of beads so that it leaves no deformity to annoy her later on. We are going to remove one side entirely. We make our skin incision elevate the skin fascia and platysma muscle. The anterior jugular vein which in a normal patient is so small that it can hardly be discovered is larger in this case than the external jugular in a normal patient. We clamp these veins between two forceps and ligate them and in that way we undoubtedly dispose of one of the sources of trouble in these cases because it seems likely that the venous stasis which is accomplished in the presence of these large veins has something to do with the hyperthyroidism.

Now we separate the anterior muscles by means of a vertical incision extending down to the gland (Figs 21 and 22). They

are the *sternothyroid* *sternohyoid* and *omohyoid* muscles. The *sternocleidomastoid* muscle is so far back that it need not be considered in this case. As a rule we find it necessary to divide the anterior muscles transversely in only 10 per cent of our thy

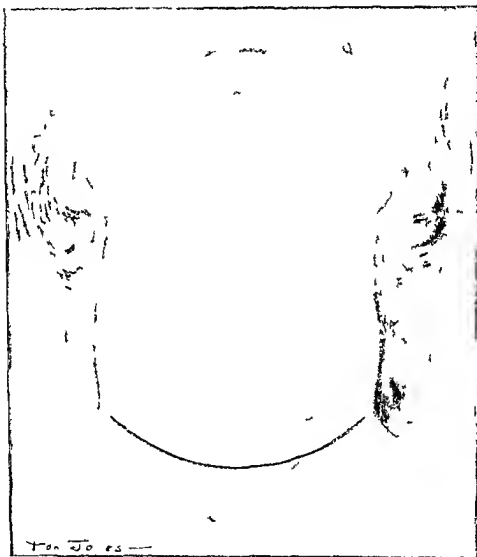


Fig. 20 —The Kocher transverse collar incision

roidectomies. It is when these muscles are unusually tense and when the gland is unusually large and cannot be delivered through the retracted edges that we resort to section. When it is necessary we apply two hemostatic forceps placed 2 cm apart



and cut between them. In this way the edges can be more easily sutured together after the gland has been removed.

To Jones—

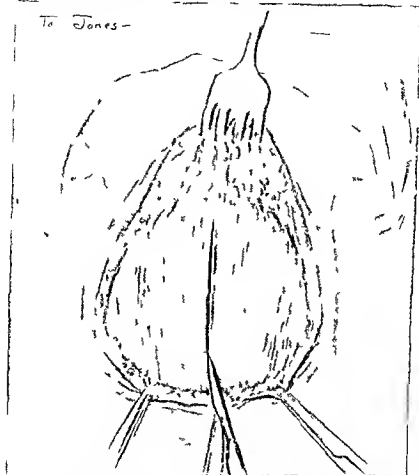


Fig 21—The skin, subcutaneous fat, and platysma dissected away from the anterior muscles and the flap so made reflected upward. Forceps applied to the subcutaneous vessels and kept in place throughout the operation. Midline incision separating anterior muscles.

The tumor extends under the sternum for a small distance and is entirely confined to the right lobe. We grasp the superior pole of the gland containing the superior thyroid artery and vein with two forceps on the proximal side and one on the distal side.

The two forceps on the proximal side are applied in order to prevent slipping, because if one of these forceps should slip, the other



Fig 22 —With the finger the anterior muscles are separated and the dissection carried down to the capsule of the gland. The same finger dissects away and dislocates the entire gland forward from its bed.

one will hold and prevent hemorrhage. The inferior vessels are then grasped within the substance of the thyroid gland, so that there is no possibility of infringing upon the parathyroid glands (Fig 23).

We now make an incision through the posterior capsule leaving a piece of this structure attached to the underlying

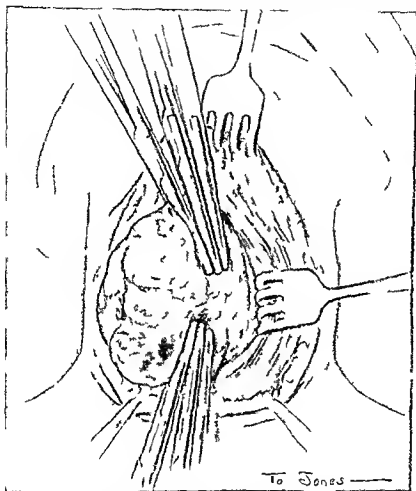


Fig. 23—The inferior and superior poles of the gland are clamped with three forceps external to the posterior capsule. Note that the forceps are applied directly into the thyroid tissue and not outside of the capsule. The line of incision will be between the outermost and middle forceps.

tissues 4 cm. in length and 2 cm. in breadth covering the lower pole of the gland. This will insure a perfect protection of the lower parathyroid gland and the recurrent laryngeal nerve be

cause at this point these two structures are located between the posterior capsule of the thyroid gland and the trachea, and so

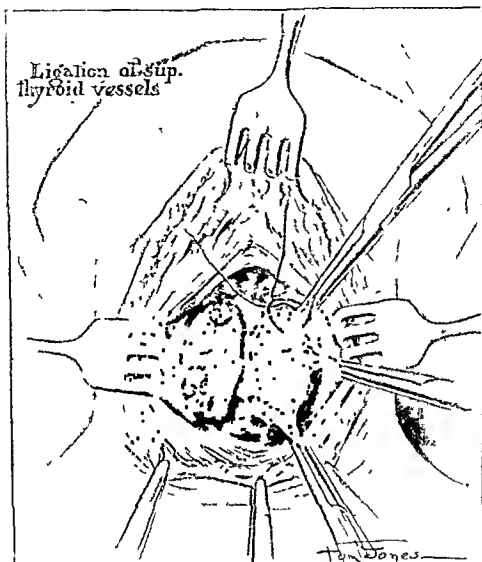


Fig. 24 —The right superior and inferior poles of the goiter with the contained arteries have been ligated. A second branch of the inferior is also ligated. These same vessels on the left side are ready for ligation.

long as we do not remove this portion of the capsule we cannot possibly injure either of these two important anatomic structures. Occasionally the parathyroid gland projects through the capsule on to the posterior surface of the thyroid gland, but even then it

displaces the posterior capsule anteriorly, so that by being careful to preserve the posterior capsule at this point one can always be sure that he has preserved the recurrent laryngeal nerve and the parathyroid gland. In case there should be hemorrhage because of the slipping of the forceps attached to the inferior thyroid vessels the greatest care must be exercised to prevent the placing of the forceps that are applied for the purpose of controlling the hemorrhage either upon the parathyroid gland or the recurrent laryngeal nerve. At this point you see how the piece of the posterior capsule has been left in position (Fig 24). Directly behind you can see the trachea showing through it. Between this portion of the capsule and the trachea we would find the recurrent laryngeal nerve and the lower parathyroid gland. It is possible to expose the recurrent laryngeal nerve at this point and recognize it as a little white line about the size of a fine sewing thread. This can be determined by following the inferior thyroid artery into the lower end of the thyroid gland. The nerve passes either in front of or behind the artery at this point. It is possible to isolate the inferior thyroid artery without difficulty at this point and ligate it separately but the artery gives off a branch supplying the inferior parathyroid gland which is likely to complicate the work.

Other workers notably in the foreign clinics have used different methods in this part of the operation. Billroth tied the inferior and superior arteries quite close to the gland with separate ligatures just before removing the gland. Kocher first lifts the inferior pole and applies a ligature between the thyroid gland and the thyroid fascia but as far laterally as possible so as to avoid the inferior thyroid body and recurrent laryngeal nerve. In this method however one must be exceedingly careful and painstaking in dissecting away the capsule. Since this space also contains the large inferior veins there is great danger of venous hemorrhage and embolism. De Quervain since 1911 has employed a ligature outside the external capsule or thyroid fascia. Finally, Dietreich and Langenbeck advocate ligation of the inferior thyroid artery at its origin on the outer side of the carotid artery. This is of course, an unnecessary distance from

the field of operation, and in so doing the sympathetic nerves have quite frequently been injured.

The plan we have described is very much simpler and infinitely safer, and consequently we make use of it entirely.

The urinalysis in this case showed a large amount of acetone, a small amount of albumin, and a considerable amount of diacetic acid, but no sugar. For that reason we are especially anxious to perform the operation with the administration of the smallest possible amount of anesthetic. The nervous condition of the patient made it an exceptionally unsatisfactory case. Ordinarily, as in this case, it is quite possible to finish the entire operation without the administration of additional anesthetic.

Because of the fact that many cases of goiter follow infections in the tonsils we always remove infected tonsils in these cases. We shall remove this patient's tonsils just before she is ready to go home and use local anesthesia in order to eliminate the danger of a second intoxication with ether.

### CASE III.—GOITER

**History.**—The patient, a married woman of thirty-eight years, was admitted to the hospital October 4, 1916, because of an enlargement of the thyroid gland.

Her family history is negative. Her past history is negative except for typhoid fever when a child. Menstrual history is negative. Her bowels are constipated, and there is some frequency of urination due to injuries received when a child. Her weight is about normal.

She comes to the hospital complaining of a goiter and of a choking sensation in the throat and of nervousness. This started following a heavy cold during pregnancy. The gland gradually increased in size, and as it did the nervousness became more marked. She has a tremor of the fingers and has some headache in the occipital region, but this is not as frequent as formerly. She is very short of breath, especially on exertion, and has frequent attacks of palpitation of the heart. There is no pain in the abdomen or chest.

**Physical Examination.**—The patient is a well-developed and well nourished female with good color. There is marked hypertrophy of both tonsils. There is a marked cystic enlargement of the right lobe of the thyroid gland extending below the sternum 1.5 cm. The enlargement is approximately the size of a small orange. On the left side the enlargement is somewhat less in size and is nodular. No bruit is heard or thrill felt. Her pulse is 88. The heart is slightly enlarged that is approximately 1 cm. to the left of the left midclavicular line. No adventitious murmurs are heard. There is a marked prolapsus of the uterus, bladder, vagina, and rectum.

**Comments and Operation**—Dr. OCHSNER (October 6, 1916) When this patient came up for the anesthetic her pulse was 140. Now she is thoroughly anesthetized after the method we always use in these cases and her pulse has come down to 80. Ordinarily the pulse does not come down as much as this. By giving  $\frac{1}{4}$  grain of morphin and  $\frac{1}{16}$  grain of atropin one half hour before the operation and then thoroughly anesthetizing the patient slowly with ether by the drop method, one can count on reducing the pulse about 25 per cent. of the excess above normal. For instance if the patient's pulse is 150, or 80 beats above normal, you can count on its coming down to 130. Supposing the patient's pulse is 140, then you can count on its coming down to 120 and so on, counting the excess above 70 you can count on its coming down about 25 per cent. but the patient must be very thoroughly anesthetized while in the horizontal position and then the head of the table must be elevated to a point at which the body will make an angle of 45 degrees with the floor. The resulting anemia of the brain will then be sufficient to maintain the anesthesia throughout the period that is required to perform the operation. The advantage in using morphin before the operation of course comes from the fact that in the first place these patients during the half hour which intervenes between the administration of the morphin and the administration of the anesthetic get quieted down, so when the anesthetic is begun the patient is in a quiet condition. Then the ether may be given by the drop method and it acts as a stimulant and cannot possibly do the patient any harm. The

patient becomes thoroughly anesthetized before you begin the operation. If you have the patient half asleep, and then begin to operate, the irritation is sufficient to spoil the anesthetic, but if the patient is thoroughly asleep, and you add to this an anemia of the brain by elevating the head of the table, then the morphin obstructs the sensitiveness, so the patient does not feel the incision and does not feel any part of the operation. She breathes quietly throughout the operation and leaves the table without any marked degree of shock. The advantage of the atropin is that its use prevents the accumulation of mucus in the pharynx. Since we have followed this plan of anesthesia in more than 500 cases we have not had one single case of pneumonia following goiter operation, because the patient does not inspire the mucus. When the patients go back to their beds you can have them sit up immediately. Much has been said about the harm that can be done by ether anesthesia in connection with goiter operations. As a matter of fact, ether anesthesia when produced by the drop method is not one particle worse than it is to become intoxicated with alcohol, and becoming intoxicated with alcohol does no harm provided it happens only once in a lifetime.

You see how careful I am in making the incision because this is a very large goiter and I wish to have space enough to lay it bare thoroughly. The left lobe extends underneath the sternum. Pulling the goiter causes her to breathe noisily because with this lobe I pulled up the trachea. I will be careful to leave enough thyroid tissue to carry on the normal secretion.

We take great care in ligating, particularly the superior and inferior thyroid vessels, because if there should be a retraction of these vessels there would be a serious hemorrhage. By grasping each one of these vessels with hemostatic forceps before they are severed we are able to remove this gland without losing more than a few drams of blood. We leave in every instance an amount of gland tissue about equal to the tissue contained in a normal gland. If we remove one lobe, the other lobe contains a sufficient amount of tissue. If we remove one entire lobe, we leave behind a portion attached to the posterior capsule. If the second lobe is also enlarged, we leave a sufficient amount of this to supply the neces-



sary amount of gland tissue to prevent the occurrence of myxedema

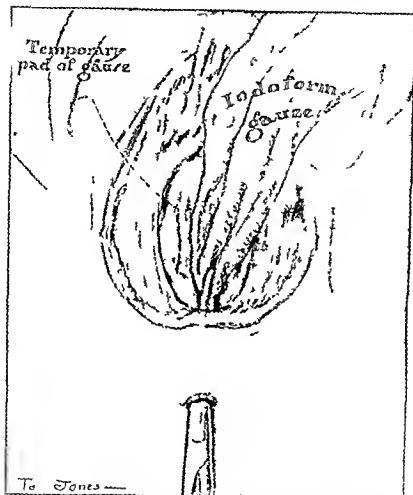


Fig 23—The goiter has been removed and a pad of gauze inserted between the anterior muscles and the stump of the gland in order to control the capillary oozing. A transverse button hole incision is made 1 c.c. below the suprasternal notch and a pair of forceps has dissected a tunnel down to the space originally occupied by the goiter and a strip of iodoform gauze and a Kocher perforated glass drainage tube carried through the tunnel. The temporary pad of gauze is then removed and the iodoform gauze takes its place and the anterior muscles are approximated with a continuous line of catgut sutures.

Now I have ligated all the vessels and the surface from which

we remove the gland is perfectly dry. We make a small transverse button hole incision through the skin 4 cm. below the lower

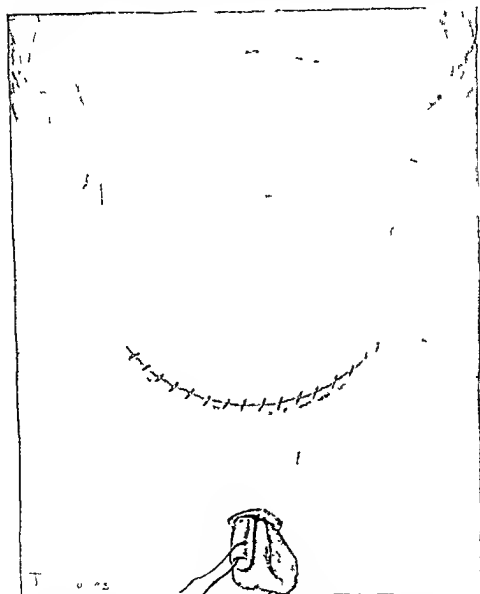


Fig. 26.—Four subcutaneous catgut sutures have been applied to take the tension off the flap. A continuous row of horseshoe sutures are then applied to approximate the edges. The Kocher tube and strip of gauze are seen emerging from the stab incision.

edge of the wound, and pass a pair of hemostatic forceps through the connective tissue underneath the edge up into the space from

which we have removed the gland so as to make a drainage canal. We then draw a strand of gauze through this opening 3 cm wide and sufficiently long to cover the entire raw exposed surface, so that any discharge will be taken up by this gauze. Then a Kocher glass drainage tube is passed through the opening and the inner end placed over the gauze so that a considerable accumulation of fluid may pass out of this drainage tube during the first few hours (Fig 25). We next unite the muscles on the anterior surface of the neck with catgut stitches. A few subcutaneous catgut stitches are applied between the upper and lower skin flaps in order to remove the tension which would otherwise be demanded of the final horsehair skin sutures (Fig 26).

A dry gauze dressing is applied with moderate pressure and held in place with adhesive strips. Over this dressing is applied a large cotton pad and the entire neck, and upper chest is bandaged with a large soft gauze roller bandage.

**After-treatment**—The after treatment of these cases is very important. This patient will be sent down to her room and the head and shoulders will be elevated upon a head rest. Proctoclysis with 500 c c of normal salt solution started every four hours and given by the Murphy drop method will be instituted at once. She will be given sips of hot water this evening and to-morrow she can have all the water she will drink. If her pulse continues to rise after the operation and if she becomes highly excitable she will be given  $\frac{1}{4}$  grain of morphin sulphate and  $\frac{1}{16}$  grain of atropin sulphate, and one half hour later will be given a hypodermoclysis of 1000 c c of normal salt solution in the pectoral region. This is usually sufficient to prevent the occasional postoperative thyrotoxicosis but sometimes it is necessary to repeat this procedure several times during the following two or three days. She will sit up out of bed on the second day and be allowed to walk on the third day. Proctoclysis is discontinued the second day when water is given freely by mouth. Bland liquid diet is allowed on the third and fourth days and on the fifth day a soft "goiter diet," a copy of which follows is begun.

The Kocher glass drainage tube is removed on the second day and the gauze carefully removed on the fourth day. On the seventh day the horsehair stitches are removed, and on the tenth

to the twelfth days the patient is allowed to go home after being given the following explicit directions and diet

1 Avoid all excitement or irritation like attending receptions, shopping church work, and politics If anything happens to annoy you put it off for a week

2 You should get an abundance of rest by going to bed early and taking a nap after luncheon

3 You should have an abundance of fresh air at night, consequently you should sleep with wide open windows or on a sleeping porch

4 You should take nothing that irritates the nervous system, like tea coffee, or alcohol Of course you should not use tobacco in any form

5 You should eat very little meat If you are very fond of meat take a little beef, mutton, or breast of chicken or fresh fish once or twice a week or at most three times a week

6 You should drink a great deal of milk or eat things that are prepared with milk, such as milk soup, milk toasts, etc, also cream and buttermilk are especially good for you

7 You should avoid beef soup or beef tea or any kind of meat broths

8 You should eat an abundance of cooked fruits and cooked vegetables or very ripe raw fruits or drink fruit juices prepared out of ripe fruits

9 You may eat eggs, bread butter, toast rice, cereals

10 You should drink an abundance of good drinking water, or if this is not available you should boil your drinking water for twenty minutes or drink distilled water

We have encountered many cases of exophthalmic goiter which have been extremely unfortunate in their condition following the removal of the thyroid gland but we have found almost invariably that this has occurred in patients who did so well a short time after recovery from the operation that they returned to their former bad habits of eating and of exposing themselves to excessive physical, mental and emotional exertion or strain Since giving each patient printed directions and explaining their importance we have not had these unsatisfactory experiences with our own patients



## A CASE OF FEMORAL HERNIA

*Summary* Femoral hernia of one and one half years standing technic of operation—expose the sac open it reduce its contents transfix and doubly ligate ascertain that the stump retracts into peritoneal cavity apply skin sutures make no attempt to close femoral canal reasons for the superiority of this method over the more complicated ones results of twenty five years experience with this method cases in which it cannot be used and how to handle them

October 9, 1916

**History**—The patient a single woman of fifty two years by occupation a trained nurse was admitted to the hospital October 8 1916, because of a femoral hernia

She was operated on in this hospital in 1909 for uterine myoma Since then she has been well except for the present trouble For the past five years she has had a lipoma on the back which has increased in size from that of a walnut to that of a good sized orange There is some soreness in the arm and axilla but otherwise the tumor gives her no trouble except in so far as it annoys her when lying on her back

About one and one half years ago she lifted a helpless patient and following this noticed a lump in the femoral groove There was some slight pain on the appearance of the lump but none since When lying down she has no difficulty in reducing the hernia

**Physical Examination**—The patient is a well developed and moderately obese woman with good color Her head and neck are negative Heart lungs and breasts are also negative Over the angle of the left scapula is a large soft lobulated non fluctuating freely movable tumor mass the size of an orange It is not tender The abdomen is negative except for a healed low median scar In the right groin over the region of the femoral canal and beneath Poupart's ligament can be felt a small reducible tumor 3 cm in diameter, which increases in size when the patient stands

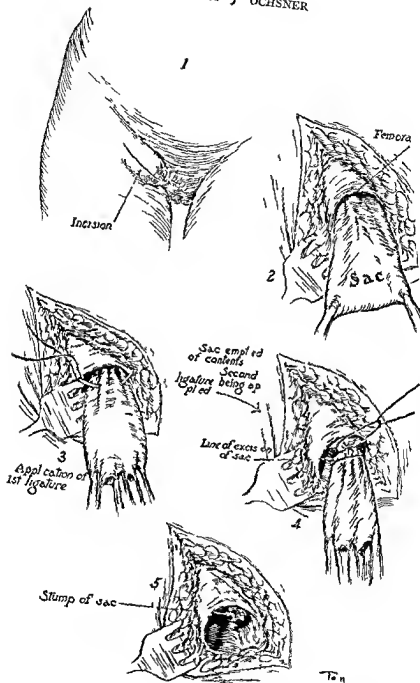


Fig 27

T. H. Jones

**Comments and Operation.**—**DR OCHSNER** (October 9, 1916): This patient is suffering from a femoral hernia. The operation which we perform for femoral hernia consists in the following steps. We make an oblique incision directly through the prominence caused by the hernia, extending down through the skin and superficial fascia and fat, exposing the hernial sac (Fig 27, 1 and 2). Then we open the sac, and if any of the contents are adherent we loosen the adhesions. The contents may consist of omentum, intestines, ovary and tube, or the appendix, and occasionally the bladder. The sac is freed entirely, so that its end alone is attached to the edges of the femoral canal. Then the neck of the sac is transfixed by means of a catgut suture, which is tied so that there is no possible chance of slipping (Fig 27, 3). Then the sac is drawn out as far as it can be and a second ligature is applied as high up as thus possibly can be done (Fig 27, 4). It is doubtful whether this second ligature is necessary, but it is applied as a precaution against the possibility of some portion of the sac escaping from the first ligature. All the loose fat surrounding the hernial sac is removed so that the wound remains perfectly clear. We have now exposed the hernial sac and have opened it, and here we find a very small piece of omentum strongly adherent to its lining. The piece of omentum is not more than 3 cm. in length, but its entire length is adherent. This readily accounts for the fact that the hernia could not be retained comfortably by the use of a truss—it could not be completely reduced. On loosening adhesions like those we have encountered in this case we must guard against traumatism so that we do not injure the tissues unnecessarily. That is an important precaution. Next, we must be careful to start at one angle and proceed systematically until we have loosened all the adhesions. If one attempts to loosen such adhesions in an un-

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Fig 27—1, Line of incision made over the hernial bulging parallel to Poupart's ligament. 2, Femoral ring and sac exposed. 3, The sac has been opened and its contents reduced. Holding the sac under tension, the neck of the sac is transfixed and ligated. In 4, with the sac under greater tension, it is transfixed at the highest point that can be reached and a second ligature tied above the first. The portion of the sac distal to the ligature is then excised. In 5 is shown the stump of the sac retracted into the abdomen. No attempt is made to close the femoral ring.



systematic way—that is, beginning at one end and then going to the other and changing about—it requires more time to loosen the adhesions, but by following the other plan of carrying out the dissection from one point and passing around the entire surface it requires but a few moments. One can loosen these adhesions in less than one minute. We take the greatest possible care in retracting the surrounding tissues, so that our ligatures will not include any of these tissues. That is really of great importance, because if our ligature should include any of the tissues belonging to the femoral canal it would not be possible for us to replace the stump within the peritoneal cavity, and that is a fundamental principle upon which the success of this operation must depend.

Our ligature by transfixion has been applied. I am quite as careful in applying this ligature as I was in applying the first one, so as not to include any of the tissues belonging to the femoral canal. In order to apply the ligature high up in the canal the sac is kept in position by means of forceps placed upon it. The edges of the femoral ring are retracted by means of gauze padded retractors. I remove some little strips of fat which are in the femoral canal so as to leave it entirely free. Then I examine the femoral ring again with my finger, and find that the ligated neck of the sac has retracted into the peritoneal cavity. No attempt is made at closing the femoral canal (Fig. 27-5), we simply apply the skin sutures with horsehair, and that is all.

A number of methods have been described for the closure of the femoral canal. The most thorough method of closure was described some years ago by a Russian surgeon. This consists in drilling holes through the ramus of the pubes and passing silver wire through these holes and fastening the edge of Poupart's ligament down against this so as to obliterate entirely the femoral canal. At the conclusion of this operation there is absolutely nothing left of the femoral canal. Another method has been described by one of the foreign operators whose name I do not recall. It consists in driving fine steel wire staples through the edge of Poupart's ligament and into the ramus of the pubes. These two methods are undoubtedly the most thorough and most

complete that have been devised, and, according to the author's observations, they are followed by the highest percentage of recurrence. Following some of these more thorough methods of closing the femoral canal there is as high as 20 per cent or more of recurrences, because in performing these operations the surgeon disturbs the circular opening of the femoral ring, and in order to keep a round opening open all you have to do is to disturb its circular character. It is practically impossible to keep a circular opening open anywhere in the body, because as cicatricial tissue forms it closes such an opening spontaneously. Therefore, if the operation is thorough enough to disturb this circular form of the opening, and especially if the edge of Poupart's ligament is loosened, the operation will produce quite a large percentage of recurrences.

The method which has been practised by Coley and Bull and which consists in the application of a circular suture to the surface of the femoral opening has been very satisfactory because it does not disturb the shape of the opening. There is a fundamental principle in surgery according to which all useless things that are done in connection with operative treatment must at the same time be harmless. Unless useless things are harmless they should not be done. Now these other operations that I have described are useless, but not harmless. For that reason they are followed by a large number of recurrences. We have used the method of operating which we have employed in the patient before you in a very large number of femoral hernias during a period of twenty five years. Some years ago I wrote letters to all the patients whose femoral hernias we had operated on during the fifteen years preceding, and among all those from whom we had answers there was not a single recurrence. The reason is that all these operations were performed by the method you saw illustrated in this case. There is no doubt in my mind that this case will follow the same rule, and that this femoral ring will close immediately and firmly.

This method cannot be employed in the very limited number of cases of femoral hernia in which the condition is due to a direct traumatism which has torn the femoral ring and has changed it

from a circular into an oblong or a triangular opening. In these cases we have freshened the edges and restored the opening as nearly as possible to a circular form by the use of chromic catgut sutures.

The same is true in cases operated for the relief of strangulated femoral hernia in which it has been necessary to cut the ring in order to replace the intestine in the abdominal cavity. In these cases we have also restored the ring as nearly as possible to the circular form, and our results have been equally satisfactory.

This method was described and recommended many years ago by Prof. Socin, of Basel, but I have never seen his article quoted. I came across his description of the operation accidentally while searching the literature after we had employed the method in many cases. So far as I know he was the first surgeon to use the method.

## HERNIAS IN CHILDREN

### Clinical Talk with Demonstration of the Operative Treatment of an Inguinal Hernia in the Case of a Child Eleven Months of Age

*Summary* Large inguinal hernia in a child of eleven months which cannot be kept from protruding by non-operative methods and which occasionally is difficult to reduce, perfect results from herniotomy in children, but the operation unnecessary and therefore not advisable in more than 7 per cent of the cases, when to operate—six conditions which warrant interference, the non operative management, the technic of inguinal herniotomy in children—importance of avoiding manipulation of the cord, the dressings and after treatment, general conclusions

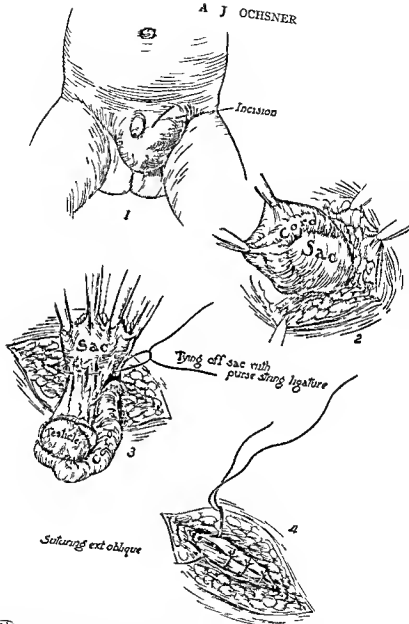
*September 11, 1916*

**History.**—The patient, a male child of eleven months, was admitted to the hospital September 10, 1916, because of a left-sided inguinal hernia

The father is living, but is at present in this hospital, having been operated on September 8th for intestinal obstruction due to postoperative adhesions. The mother is living and well. There is no history of tuberculosis or malignancy in the family. The patient had a diarrhea for two days in June. He has always been healthy, with the exception of the trouble for which he is brought to the hospital.

Two weeks after birth the mother noticed a swelling in the left inguinal region. It was just perceptible at first, but has gradually increased in size until now the whole left side of the scrotum is filled. The baby is not fretful and eats and sleeps well. The bowels are regular. He also has a phimosis.

**Physical Examination.**—The patient is a well developed and well-nourished baby. Head, neck, chest, heart, lungs, and abdomen are negative. The right groin and right testicle are negative. Arising from the external inguinal ring on the left side and filling the left scrotum is a tense, spindle shaped mass (Fig 28, 1), which, when the patient is placed in the inverted



*Ten Jones —*

Fig 28—In 1 is shown the large hernial bulging and the site of the incision. In 2 and 3 the method of exposing and handling the sac is shown. Note the remnant of sac representing the tunica vaginalis about the testicle. In 4 is shown the simple closure of the incision in the external oblique—all the sutures that are necessary as a rule.

position, can be easily reduced with the fingers. Upon coughing or crying the bulging protrudes even when the child is in the inverted position. The external ring admits the tip of the first finger. It has been quite impossible to keep the hernia from protruding, and when it has been forced out to a marked extent its reduction has been difficult, so that the mother has been in constant fear of strangulation. There is a marked phimosis, so that the glans cannot be seen.

**Comments.**—**DR. OCHSNER** (Sept. 11, 1916): About twenty years ago I had occasion to operate upon several strangulated hernias in children, and the results were so satisfactory that it seemed to me as though it would be proper to operate on all congenital hernias in children, because in a few weeks the children upon whom I operated were well without having been exposed to very much danger. This same view is taken at the present time by many surgeons. Harold Stiles, of Edinburgh, surgeon to the Children's Hospital, has written a great deal upon this subject, and the argument he makes is that children recover in a week or two from hernia operations, that they are not harmed in any way, and that in the last 100 cases he had an infection in only 1 case. Consequently the annoyance which the child has from the hernia during the time it is growing up, and the danger of strangulation and the harm that comes to the child from being unable to play like other children will be eliminated by operating upon them. That strikes one naturally as a most reasonable argument if one looks at it simply from an operative standpoint.

In looking up the literature I found that the subject had been studied very carefully by Malgaigne about sixty years ago. He had the children examined when they first went to school. He had them again examined when they were eighteen or nineteen years of age and ready to join the army. The result of the examination was quite striking. He found that 73 per cent. of those who had hernia in infancy were free from hernia when they had grown up, and that without any treatment at all. The ring simply closed without any surgical or medical care. Seventy-three per cent. had gotten perfectly well between the time of the first examination and the time of their entering the army. This

seemed to indicate that the proposed plan of operating on every child with hernia could not be looked upon as reasonable when 73 per cent got well spontaneously. That led us to make further observations and we found that in our own cases over 90 per cent recovered spontaneously without operation provided the cause of the hernia was removed. It happened about the same time that I was called to see a child suffering from a strangulated hernia. The usual attempts at reducing this hernia failed so I took the child in my carriage to the hospital with a view to operating. I had the father hold the child on his lap while we drove to the hospital and when we arrived the strangulated hernia had been spontaneously reduced so I placed the child in bed with the foot of the bed elevated for the purpose of preventing a recurrence and in three weeks the hernia was healed spontaneously and has remained healed ever since so that that observation was added to what I had learned from the study of Malgaigne's work.

Shortly after that a child was brought to me that was suffering from a severe phimosis and also from an inguinal hernia and I thought that while the child was recovering from the phimosis operation it might as well recover also from a herniotomy so I proposed to the parents that we do a herniotomy at the same time. Thus they refused and to my surprise when the child was well from the phimosis operation the hernial ring had closed. At that time I was consulting surgeon to the Children's Hospital and had an opportunity of seeing a good many cases of hernia in children and I have had since that time an opportunity of following up a large number of these cases. In that way I have had an opportunity of determining what class of cases require operation.

In our study of the literature of these cases we found that Coley and Bull had observed 15 000 cases of hernia in children in the Hospital for Ruptured and Crippled in New York. They found it necessary to operate in about 5 per cent. The rest recovered spontaneously or disappeared from treatment. In our own observation the same proportion holds good so that we believe that only patients suffering from the following six conditions require surgical treatment.

(1) Cases that have a congenital deformity in which the muscles congenitally are not developed properly, a class of cases in which when you look at the abdomen you observe three distinct points of prominence, a condition which is known by the French surgeons as the "abdomen of three hills." In this class there is a marked abnormality in the attachment of the internal oblique and transversalis muscles to Poupart's ligament, a condition which Dr. Ferguson pointed out as being practically always present in adults suffering from hernia. When this condition is marked the hernia will not recover spontaneously.

(2) Cases of the class that we have to deal with in our patient today, where every day or so the hernia goes down and the parents find it difficult to reduce it. Hernias which cannot be retained by any method that may be employed and which show a tendency to strangulation. In the case before us the hernia protrudes even when the child is in the Trendelenburg position and it is difficult to prevent its protrusion with the finger on the inguinal canal.

(3) Cases in which a strand of omentum has become attached to the hernial sac or in which there have been adhesions to one of the intestines, usually the cecum, so that, although the hernia is not strangulated, it cannot be reduced because of this adhesion.

(4) Cases in which the hernial opening is kept permanently open because of the presence of a hydrocele of the cord which slips in and out of the inguinal canal and prevents this canal from closing, and so, in turn, permits the hernia to protrude.

(5) Cases with undescended testicle with an inguinal canal that is so widely open that its spontaneous closure seems quite improbable.

(6) The last variety of hernia in children which requires an operation is the variety in which there is an irreducible strangulation.

These classes constitute about 7 per cent. of all cases of hernia in children. Now, then, if we should operate upon every case of hernia in children we would have to operate upon 100 children in order to cure 7. Of course, that would not be quite fair to the 93, but would be fair enough to the 7 cases; that is, 7 would prob-



ably have to be operated sooner or later because they have deformities which make a spontaneous cure of the hernia impossible

Now regarding the difference between the 73 per cent. of fifty years ago and the 93 per cent of today, I will say this, that those patients who recovered in the series that Malgaigne reports were not treated at all. The cause of the hernia was not removed. Now in our cases we teach the parents to take care of these children with hernias so as to guard against abnormal intra abdominal pressure. We give them laxatives to prevent constipation we operate for phimosis so as to relieve the obstruction to the passage of the urine, we eliminate articles of food that cause gaseous distention of the intestines, and, above all, we place the child in bed with the foot of the bed elevated about 30 degrees so that the mesentery has a chance to retract. Usually it requires from three to six weeks for hernia to close. In many cases it is not necessary to keep the children in bed day and night but putting them to bed at 5 o'clock in the evening after an early supper and permitting them to be up during the daytime.

We have encountered some children who could not be kept confined to their beds in the Trendelenburg position because they would move about and change their heads to the foot of the bed, and in that way interfere with the plan of treatment. In these cases we have continued the plan of permitting them to be up during the day time and placing them in the desired position at night. When this form of treatment has failed, we have applied rubber adhesive straps to both legs, and have placed the patients in bed on their backs and suspended the legs by means of weights and pulleys. This position seems to be even more favorable for a rapid closure of the inguinal canal than the simple Trendelenburg position in bed, but it is of course less comfortable. For this reason we have not employed it in patients who were willing to maintain the Trendelenburg position without this aid.

Then we have found quite a series of cases in which the hernia healed spontaneously every summer and opened up every winter, because the children got coughs, and in coughing opened the her

nias In this class of cases we advise the parents to give the children cold sponge-baths winter and summer, and have them wear woolen underclothing, sleep between woolen blankets, and keep the windows wide open, so that they do not get coughs and so avoid recurrence of the hernias As a result of this treatment 93 per cent of our cases get well without an operation, and only those belonging among the six classes I have mentioned require an operation

An argument in favor of operating upon hernias in children has been made according to which it is supposed that by operating upon children one may avoid operations upon the adult which would otherwise be inevitable It seems, however, that this argument cannot be supported by clinical observation, because the proportion of patients who have spontaneously recovered from hernias during childhood, or before the twelfth year of age, who have later on acquired hernia is exceedingly small In our own clinic we are not in a position to give the exact figures showing the percentage of such cases, but I am convinced that the number has been so small that it need not be considered

### OPERATION

Yesterday when I tried to reduce this hernia I did not succeed at first, although the mother said that it would go back, and later reduction was possible.

In operating upon these small patients the incision is made precisely as in the adult, down through the aponeurosis of the external oblique muscle so that the entire inguinal canal is exposed. From this point on, however, it is of the greatest importance to exercise unusual care in order that the delicate tissues of the cord may not be permanently injured. None of the tissues of the cord should be caught in the bite of the forceps In case of bleeding, the end of the vessel should be caught with the greatest possible care, and a fine ligature should be applied immediately in order that the tissues may not be pulled upon by the forceps

I am separating the cord very carefully because it is very important that I should not injure any of its structures This can be done by picking up this peritoneal tissue step by step until

I have the entire sac free and then lifting up this sac so that the neck of the sac is virtually exposed and when this has been accomplished the tissues of the cord are pushed out of the way and the sac is ligated quite a bit higher so that when the superfluous portion of the sac is cut away the stump will retract into the peritoneal cavity (Fig 28 2 and 3) The portion of the sac which lies about the testicle I will not disturb because it will take the place of the tunica vaginalis. In fact it is the tunica vaginalis only its embryologic communication with the peritoneal cavity failed to be obliterated in the ordinary manner. The testicle which has been drawn out during this operation will be replaced in the scrotum. We ligate everything with the greatest care because we wish to have this wound absolutely dry. Now you see we have not interfered in any way with the cord and so far we have not interfered with the inguinal canal.

Now we have all the bleeding vessels connected with the cord ligated, as well as all the little vessels that we cut in making our original wound. This is done in order to keep the wound absolutely dry.

The next question is that regarding the closure of the inguinal canal. The sac having been retracted I find that the inguinal canal here is small enough to close spontaneously and consequently I shall not disturb it in the least. I follow the method which Mr William Anderson of St Thomas Hospital London, introduced thirty years ago for the radical cure of ordinary inguinal hernia in the adult which consists simply in removing the sac within the inguinal ring ligating it and dropping the stump back and leaving the canal to close spontaneously. I simply close the aponeurosis of the external oblique abdominal muscle and the deep tissues of the outer wound with care and then suture the skin (Fig 28 4). In cases in which the canal will not close enough to practically ensure a spontaneous cure we make use of the method employed by Harold Stiles of placing one or two sutures to include the internal oblique and transversalis muscles on the inner and Poupart's ligament on the outer side, which in this case does not seem to be necessary. In no case do we make use of the Bassini operation because of the fear that by manipu-

lating the cord in the way required in that operation we might cause a permanent injury to that structure and resultant atrophy of the testicle. In the cases in which there is a very marked congenital defect, so that the inner and outer surfaces of the canal do not meet, we make use of the Ferguson Andrews operation, that is, we leave the cord in the bottom of the groove, and suture the internal oblique and transversalis to the shelf of Poupart's ligament, and then imbricate the aponeurosis of the external oblique so as to double it, according to the method introduced by E. Wyllys Andrews. That does not compress the cord and still makes a very perfect closure, but is ordinarily not necessary.

This patient has a very bad phimosis. We will loosen up the adhesions of this prepuce and, if it seems wise, make a circumcision. We find that after tearing the adhesions between foreskin and glans the foreskin is readily retracted. Therefore circumcision will not be necessary. In cases like the one before us, in which it seems that the condition will not require it, we do not make a circumcision but simply loosen the adhesions. The operative wounds and surrounding skin are now covered with vaselin so that they will not be soiled with the urine, and dressings are applied. The baby's hands are tied so that he will not be able to disturb the wound.

A number of methods have been employed for dressing these patients. The one introduced by Harold Stiles in the Children's Hospital in Edinburg, is probably the best. The little patient is strapped upon a frame similar to the Bradford frame that is so well known in this country and the wound is left entirely uncovered which enables the nurse to keep the child from soiling the wound. It is by following this plan of dressing that Dr. Stiles has obtained most remarkable results. In an institution in which there are constantly many of these patients this is undoubtedly the best way. In the average hospital however the parents of the patients are likely to object to this method which seems unusual to them but which in reality, is not at all burdensome to the patient. If this plan cannot be employed a vaselin dressing which will protect the wound against soiling with urine is probably the best to be employed.

**Conclusions** —1 The development of hernias in children is favored by (a) Faulty development of the abdominal wall, (b) insufficient strength in the tissues involved in closing the umbilical, inguinal, or femoral openings, (c) abnormal intra abdominal pressure, (d) patency of the tunica vaginalis

2 The causes *a* and *b* are frequently inherited

3 The abnormal intra abdominal pressure is due (a) To gaseous distention resulting from improper feeding, (b) to the exertion necessary to evacuate the bladder on account of obstruction due to phimosis (c) to severe, long-continued coughs, (d) to vomiting (e) rarely to traumatism or overexertion

4 Approximately 95 per cent of all cases of hernia in children will heal spontaneously if the abnormal intra abdominal pressure is relieved and the hernial sac is kept empty

5 This can be accomplished by means of trusses or much more rapidly in inguinal and femoral hernia by placing the child in bed with the foot of the bed elevated, the time required usually does not exceed six weeks and in most cases the hernia will heal upon relieving the abnormal intra abdominal pressure and simply placing the child in bed with foot of bed elevated from 6 P M each night to 8 A M the following morning for several months

6 Children with a tendency to the formation of hernia should be guarded against developing coughs

7 The diet should be given at regular times and chosen with a view to avoiding gaseous distention

8 Constipation should be entirely prevented

9 In case of boys phimosis should be relieved, if present by operation

10 Badly nourished and badly cared for children of the poor should be treated in hospitals being placed in bed in the Trendelenburg position the cause of increased intra abdominal pressure being removed at the same time by proper diet and treatment

11 Operation is indicated (a) In strangulated hernia (b) in irreducible hernia due to adhesions (c) in case the opening is unusually large in a free hernia especially if the condition is hereditary, (d) in reducible hydrocele, (e) in cases with unde-

scended testicle unless they show a tendency toward spontaneous cure.

12. Except in class *c* the operation should consist simply in carefully dissecting out the sac, or in certain cases of congenital hernia, the neck of the sac, ligating it within the abdominal cavity, cutting away the sac and permitting the stump to retract within the abdominal cavity, and closing the skin wound.

13. In class *c* the Ferguson-Andrews operation is indicated.

14. In class *e* the Bevan-Ferguson-Andrews operation is indicated.

15. The recumbent position, with the foot of the bed elevated, is of very great importance in the after-treatment of operative cases as well as in the non-operative treatment of hernias in children.

16. In young children who will not remain in bed with the foot of the bed elevated this position can usually be maintained by applying rubber adhesive straps to both lower extremities and having these held in a vertical position by means of weights and pulleys.

17. If the child cannot be kept in this position, a well-fitting truss should be worn night and day until there has been no protrusion for at least six months; at the same time the necessary precautions must be constantly taken to guard against abnormal intra-abdominal pressure from any cause.



# CLINIC OF DR E WYLLYS ANDREWS

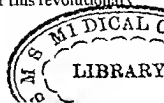
## MERCY HOSPITAL

### FRACTURE OF THE PATELLA TREATED BY OPEN OPERATION

*Summary* Repair of the ruptured joint capsule is essential and curative—bony union an incident and not essential importance of early mobilization technic of operation—absolute asepsis imperative period of disability shortened and late results much improved over those obtained by older methods

IN our clinic the old term "wiring the patella" has no meaning. We have not in the past ten years drilled the fragments or used wires to hold the bone itself. We regard the operation as a closure of a rent in the anterior half of the capsular ligament to be repaired from side to side with many stitches, and the patella only as a sesamoid bone in the course of a tendon whose repair takes care of itself. It is true that we get bony union when we do this repair work, but this is an incident and not an essential, whereas repairing the ruptured joint capsule is essential and curative.

So far many surgeons will agree with me, but I find many are skeptical or hostile when I speak of the after treatment I employ. I advise and practice early active and passive movements of the knee-joint after operative reduction. I mean by this that I use no cast or support, and bend the knee on the operating table the next day and all subsequent days until recovery. I also use active or voluntary leg movements involving the broken bone. After the skin wound is well healed, in from one to two weeks I remove all dressings, have the knee massaged and bent a little daily, and cause the patient to flex and straighten his knee by his own muscles. In one clinic before the Chicago Surgical Society I showed a man three weeks after operation who could raise his leg and foot off the table and extend the knee entirely by the function of the united capsule and patella. I found none of my colleagues who had anything but disapproval for this revolutionary





idea, and the discussion developed the information that most of them kept these cases from five to eight weeks in casts as a routine after operation.

In defense I will say that with proper suturing the capsule is enormously strong, stronger the day of the operation than at any subsequent time until tissue repair is under way. If a suture will not stand light passive motion of the knee, much less will it stand the spastic pull of the quadriceps, which occurs as well in the cast as without it. On the other hand, we believe that repair goes on far more rapidly and certainly in parts which are daily moved and massaged. Trophic changes are noticeably absent with this method and are unmistakably present and objectionable in the old method. *Everything we know about injuries to other joints goes to prove that the repair both of bone and ligament is greatly hastened and assisted by the improved circulation which movement and massage affords.*

Finally, when a patient is allowed to use his limb after complete union by this method, no limitation or disability remains. Can we say as much for the fixation management? Our experience with long fixation, either after operative or non-cutting management, is that months or years of partial stiffness await the patient after the final removal of all appliances.

I will now illustrate the mode of operating which gives us such confidence after the repair. I sometimes speak of these operations as "laparotomies on the knee-joint." The method is essentially an American contribution to surgery and owes much to Dr. Joseph Blake, of New York, who early called attention to the importance of closing the torn lateral ligaments to support the bone. Every fracture with separation shows certain pathology outside the bone. A wide fissure extends from condyle to condyle about half the circumference of the joint. The broken bone has *nothing to do with causing this tearing of the capsule.* The capsule is not torn because the bone gave way, but the bone is broken because it lay across the line of torn tendon and ligament. The patella neither weakens nor strengthens the knee. It is not there to give strength, but leverage. It is a pulley wheel only, but the rope that has the strength is the quadriceps tendon and ligament.

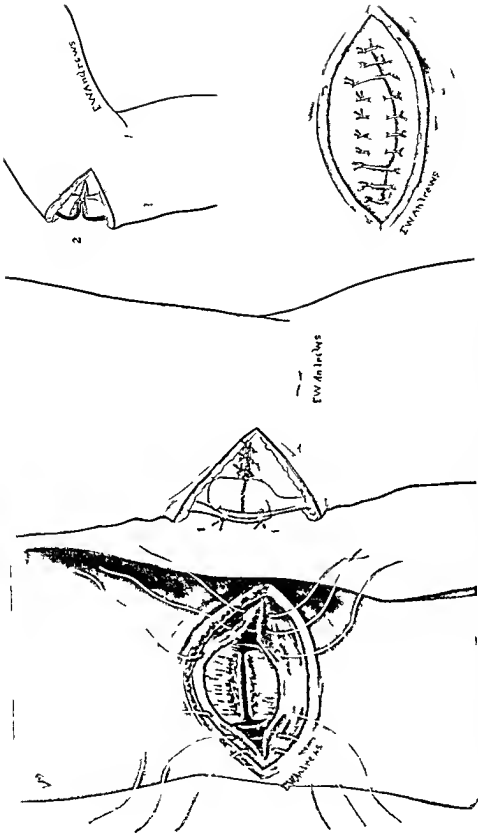


Fig. 29—Open incision showing tear in lateral ligaments 1 Sutures in place and overlapping of anterior fascia 2 fringes of periosteum and ligament lying between broken bones

The patella by raising this cord away from the condyle groove increases the radius of this pulley wheel about 25 per cent. When the tear occasionally occurs just above or below the patella we have surgically about the same injury—a torn capsule—only without associated fracture.

The torn ligament presents each side of the patella a gaping V shaped opening leading directly into the joint which is usually full of blood. After careful cleansing of the synovial cavity preferably by a jet of warm sterile salt solution without sponges fingers or instruments we begin closing these V shaped tears at their apices that is at each condyle. Durable catgut or kangaroo tendon of good size is required. Often I have been able with a separate light suture to repair the torn synovia as far as the patella border but never successfully across its inner surface. As we approach the middle line with interrupted sutures from each side we soon have the edges of the bone in actual contact and now we observe that the fragments are often inverted and have to be drawn forward and cleared of a sheath of ligamentous tissue and torn periosteum which cover their broken ends. Until this is done the fractured ends will not come into bony contact. Thus leaves a fringe or flap of some size hanging from each fragment. Instead of cutting these away I use them overlapped and sutured over the front of the bone to assist repair and they add greatly to the strength of the suture. It is as if there were a band of ligament from the quadriceps tendon above to the ligamentum patellæ below transmitting the pull of the powerful quadriceps partly through ligament and not wholly through bone. The last lateral sutures—the pair adjacent to the bone on each side—should be placed very carefully and be double or of large size. Just as they are drawn the cartilage margins and whole surface of the fragment should be accurately adjusted to each other. When care is taken and these

t

overlapping of the anterior flaps the periosteoligamentous flaps I have just described can now be done and I advocate also a circular loop of large kangaroo tendon around the entire patella passing through the tendon above and ligament below.

We have now by the adding of one stitch to another built up an enormously strong line of repair. I believe we have demonstrated by our active and passive movements—postoperative—that this is ample to stand all reasonable passive motion and light active motion, say to the degree of lifting the weight of the foot and leg. I know absolutely that this is true just after operation. Whether there is a period after stitch absorption and before complete tissue repair when rupture of our union might occur I cannot determine. I have seen but one failure due to an unruly patient disobeying orders and walking in five weeks. He fell down while intoxicated and had his union give way. On the other hand, I have seen this occur after a much longer time when the bone had been merely wired together—in one case after fifteen or sixteen weeks.

One advantage of careful closure of the capsule separately from the skin is that it makes it almost immune from infection. The only infections I have ever seen with the method were slight stitch sinuses near the surface with no sign of arthritis or synovitis. Like the peritoneum, the synovial surfaces will resist and repel invasion of septic material if given a chance to seal themselves aseptically. I have never in a large series of cases seen any hydrorrhea or synovial flow after operation nor any floating patella or usual signs of distention or gonitis.

This is an operation only for the careful, scrupulous enthusiasts in bone surgery. Sponges, instruments, and gloved hands should not touch either the wound surfaces or any needle, thread, or knife-blade. The technic of handling all instruments in passage with forceps and of tying all knots without touching the fingers to thread or needle is easily acquired in any clinic. It may be seen in its perfection in many places where bone surgery is being taught.

Given these precautions, the operative treatment of fractured patella is considerably surer, quicker, and easier for the patient than the non-operative, and almost equally safe. It gives a far more perfect result than was formerly obtained, and fewer cases of refracture and permanent lameness.



## THREE CASES OF PLASTIC SURGERY

*Summary* Case I Cicatrix binding arm to side following a severe burn technic of division of webs either cicatricial or congenital which is necessary in order to prevent recurrence Cases II and III Illustrating the advantages of flap methods and abdominal skin pockets over Thiersch grafts for the repair of extensive cutaneous defects on the hands and the technic involved

### CASE I—OPERATION FOR LARGE WEB BINDING ARM TO THORAX

This patient I M, age nine years, had a severe burn five years ago extending from the shoulder to the thigh and inner side



Fig. 30—Large web of cicatrix binding arm to chest wall

of the left arm. The resulting cicatrix is dense and deeply adherent in its lower half, forming a keloid like mass across the hip

and waist line Above this level the scar tissue has been allowed to form extensive adhesions between the trunk and inner aspect of the arm as far as the elbow binding the limb to the side In spite of all efforts at passive motion these have persisted but now have been stretched into a triangular web or fin allowing the arm to be abducted a few degrees from the body line The membrane is thin—not over 1 cm—but limits the use of the arm 75 per cent and prevents the use of ordinary clothing (Figs 30 and 31)



Fig 31 —Posterior view of F. 30 showing limitation of motion.

The problem here is the same one presented by web fingers and toes but on a larger scale viz to so divide the membrane that its healing will not reproduce the bridle of scar tissue as bad as before Exactly the same trick of technic serves us here as in similar webs in any part of the body This is in brief to secure a round healed perforation at the upper angle of the web and later divide the whole band The photograph shows how well this succeeded the arm coming easily to the horizontal line after

complete healing (Fig 32) In two months this boy could raise his arm almost to a vertical position

The round foramen should be made at the first operation at the highest point to be released Time enough is then allowed for its edges to become smoothly cicatrized The rest of the web can be cut at a later stage and the triangle will then have little tendency to bridge across When this is not done a very obstinate tendency is present during the healing to produce the web from the corner or angle outward In spite of all passive motion

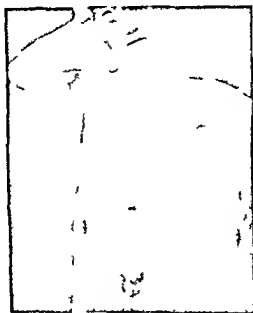


Fig 32 —Result of operation for removing cicatricial web

and forced extension this keloid like action persists sometimes entirely reproducing the false bands that were cut and also making the healing slower in proportion to the degree of traction kept up

With the preliminary foramen no tension at all is met in the wound surfaces We have two spaces instead of one long one to heal The upper angle having been fixed by the preliminary hole, is not distorted or in any way an obstacle to repair



# CASES II AND III—FLAP METHODS AND ABDOMINAL SKIN POCKETS VERSUS THIERSCH GRAFTS AFTER HAND INJURIES

Two cases are here shown in which we have chosen to employ large flaps of the abdominal wall to cover defects of the hand

CASE I—Mrs H R had lost all the dorsal skin of the hand and had tendon adhesions so that all extensor power in the fingers was abolished The method here used involved three distinct steps all equally important

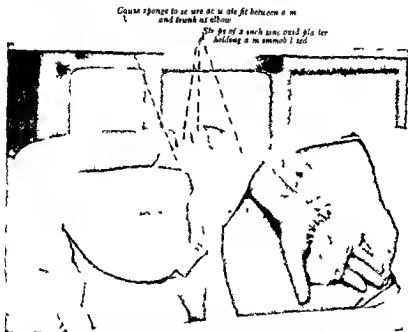


Fig 33—Patient is lying on her right side First stage completed Operation done September 7 1915 Double pedicled flap is sewed to skin edges at fingers and near wrist with interrupted silkworm gut stitches

(a) Dissection of the extensor tendons from their sheaths along the dorsum where they had become immovably adherent

(b) The formation of a new bed for these tendons by underlaying them with a free transplant of fascia lata This was obtained with about  $\frac{1}{2}$  cm of adherent adipose tissue and was laid fatty side outward beneath the tendons At this stage of the operation the fingers were bound to be fairly movable

(c) The exposed hand and tendons were now covered by a flap of skin and fat obtained from the abdominal wall by forming a pocket of the right size and shape neatly to cover the defect. As the fingers were not denuded, they were allowed to project beyond the pocket of skin, which thus became a sort of band or bridge fed by its end vessels. The hand was thrust through the



Fig 34—First stage completed (Detail) In upper left hand corner we see the adhesive tape (Z O plaster) binding elbow and upper part of forearm to abdomen and trunk. Operation done on September 7, 1915. a, Gutta percha tissue drain beneath hand.

pocket in the skin, and the underlying muscle and raw surface protected by a sheet of thin rubber or gutta-percha.

Care should be taken that the hand lies in an easy position without traction and that the flap has good arterial supply. This is well attained by making its base on one side cover the distribution of the superficial epigastric artery which runs upward and inward from about the middle of Poupart's ligament

It happens also that this location permits the arm forearm wrist and hand to lie in an easy position of slight flexion (Figs 33 and 34)

To secure good union the edges of the prepared area on the hand must now be sutured accurately to the borders of the flap. Here care must be taken not to create tension or pressure. With



Fig 35—Second stage completed. This operation done September 21 1915 consisted in dividing the pedicle at the radial side of the hand. Note bismuth subiodide powder causes the black dirty appearance and hides the knots of the interrupted silkworm gut sutures tied with a surgeon's knot—i.e. a double or friction knot.

the elbow and arm held by plaster or starch dressings all this can be avoided and primary union will be advanced enough in ten or fifteen days so that the ends of the flap can be severed and its circulation maintained from its newly united margins. I have lost such flaps from cutting them loose after seven days and have had one live when divided on the eighth day. Experience leads

me to regard ten days as a minimum safe time. Occasionally I have divided only one end and left it in position for a few days (Fig. 35). When the flap is entirely severed from its two bases its cut margins are also stitched to the margins of the hand after refreshing the edges of both.

The gap in the abdominal skin can usually be drawn together at the same sitting by strong sutures. To make this easy its margins may be undermined a little.

CASE II.—This is of similar history, the back of the hand having been denuded by a crushing injury some months ago. The tendons are not adherent in this case, but the large dense cicatrix which will be left even with Thiersch grafting is very



Fig. 36—Defect on back of hand and wrist covered by skin-flaps.

undesirable in manual labor. A soft and movable skin cover can only be obtained by a flap transplant. Here, the defect being upon the back of the hand, the position is an easy and natural one when it is placed in a skin pocket formed by two parallel cuts about 10 cm. apart (Fig 36).

A different problem presents itself when the palmar surface is to be grafted. Either the hand or the flap must be inverted to get the proper apposition. To invert the hand so as to make its palm face outward we may best place it on the outer side of the thigh. Here it lies fairly comfortable in a position of inward rotation covered by the skin-flap as on the abdominal wall. To invert the flap itself we must leave it attached only at one end,

turn it completely over so as to face outward and stitch its free end and lateral borders to the palmar defect. This can be done either on the abdomen or thigh. In a recent case we lost one such flap by sloughing the hand having been placed in a skin pocket on the outer side of the thigh. This is more likely to occur there than on the abdomen probably because the tension is greater and its vascular supply less abundant.

## A CONTRIBUTION BY DR L L McARTHUR

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### AN IMPROVEMENT IN THE TECHNIC OF GASTRIC SURGERY

*Summary* Indications for the introduction of liquids into the intestinal tract through biliary fistulæ value of the procedure in shock and in other post operative complications complete control of vicious cycle technic—hot slightly hypotonic solutions the best acid solutions not tolerated experience demonstrates this to be a valuable conservative detail not a surgical insult

Two years ago I chanced to have in my service almost at the same time three consecutive cases of stomach surgery associated with such frank bile tract disease as to require simultaneous interference. The close sequence of these cases and their strikingly smooth convalescence, with freedom from those annoying post-operative sequelæ—vomiting, vicious circle, shock, anuria, etc—excited the comment of both my assistants, the nurses, and myself. On analyzing the postoperative histories of these cases, it was noted that in quite our routine way we had utilized the existing biliary fistulæ to meet some of the several indications arising during their convalescence.

For the benefit of those present who may be unfamiliar with the previous suggestions of the writer, amplified and improved as they have been by Matas, the Mayos, Clermont, Von Haberer, and others. I may digress to the extent of stating that through existing biliary fistulæ it has been shown to be easily feasible to introduce distal to the stomach into the upper intestinal tract any quantity of any appropriate liquid, often with surprisingly beneficial results. Thus, Dr Wm Mayo demonstrated that the postoperative vomiting so often complicating bile tract surgery could be relieved and the stomach washed out by the instillation of a liter or two of hypotonic salt solution. The writer reported several cases of complete anuria incident to a cholemic nephritis

restored to active secretion by the same procedure. Matas after having saved 3 such cases complicating common duct stone with chronic jaundice, became so convinced of the great value of the procedure that, under gas anesthesia, he purposely created the first therapeutic biliary fistula in the *normal* gall bladder. A young boy suffered from a complete anuria complicating a recent septic peritonitis. Through this fistula he immediately instilled large quantities of hot Vichy Celestins into the duodenum, with the prompt return of renal secretion and a restoration to health after other methods had failed.

Whatever may be the mechanism of shock, most authorities are agreed that there is a diminished amount of blood in the peripheral vessels with a corresponding increase in, engorgement of, or stasis in the splanchnic system. For that condition to which we are accustomed to apply this term "shock" I have found no procedure to act so promptly, safely and surely as the utilization of an existing biliary fistula through which to freely bathe the upper intestinal mucosa, with a hot hypotonic mildly alkaline salt solution containing a physiologic dose of adrenalin. Undoubtedly the best place for the absorption of fluids in the economy is the upper intestinal tract. The best excitant of normal peristalsis of the same would be some such above-described *hot* easily assimilable fluid. It is an accepted law of physics that fluids flow through capillaries for the walls of which they have an affinity. Hence, with such instillation there starts up once more, aided by this peristalsis the flow through the portal capillaries, the splanchnic stagnation is overcome, and the picture changes most gratifyingly to one of peace and comfort. It might be insisted that the Murphy drip or Kanavel's continuous hypodermocleisis would accomplish the same results. Based on physiologic grounds as well as personal clinical experience, the assertion can be made that neither the one nor both combined accomplish quite the same results. In hypodermocleisis the change in the splanchnic circulation is only secondarily affected, there is no influence on the peristalsis of the small intestine. Colonic instillations by a reversal of a normal physiologic process, it is true, are absorbed, enter and improve the portal circulation,

but neither so marked in degree nor so efficient in kind as when the same fluid bathes the jejunal lining.

Whether the claim of Paterson, that the cure of stomach ulcer after the making of a gastrojejunostomy is a chemical one due to the constant bathing of that ulcer with alkaline bile, is true or not, I cannot agree with him that the stomach is entirely indifferent to the presence of bile. Nor have I lost, with growing experience and improvement in my operative technic, my respect for the symptom-complex "vicious circle" as applied to ordinary gastro-enterostomies.

Whatever the cause permitting the flooding of the stomach with bile (even the brief anesthesia for some minor work), we know how regularly follows the spontaneous emptying of that stomach by emesis. I am quite prepared to admit that with every gastro-enterostomy some bile enters the stomach, and, further, that the gastro-enterostomized stomach develops in a relatively brief time a tolerance thereto. What I do claim, however, is that in those cases of stomach surgery complicated by the need of biliary fistulæ, whether gastro-enterostomies with or without excision of ulcer, resections of the stomach for malignant disease, or resection of ulcer-bearing area, I have been able to obviate those serious complications above described by the utilization of such biliary fistulæ.

Hence it was but a step, after such a clinical demonstration of its efficacy, to add to the technic of a gastro-enterostomy or stomach resection a *temporary biliary fistula* made in the normal gall-bladder. A double purse-string suture, inverting around a small rubber tube the fundus of the gall-bladder, and the bringing out of the same tube through the abdominal incision or through an appropriately placed stab puncture complicates the stomach surgery but little more than the making of a stab puncture through the abdominal flank for peritoneal drainage. For the past two years in a majority of my gastric operations this has been done. One hesitates to speak in numbers of stomach operations when in such close proximity to the Mayo Clinic. The writer has had in the past two years a scant twenty in which to study the data herein described. The results have,





Fig 37—1 Tube in gall bladder arrow denotes path from gall bladder via cystic and common ducts to duodenum 2 Thermos-container for fluid and rubber tube connections with drainage tube which is seen projecting from incision in abdominal wall

however, been so gratifying when this procedure has been utilized that I have the temerity to here endorse and recommend its trial

With such a fistula established, one has so good a control of the usual complications of the situation that a veritable sense of security of the convalescence of and assurance of comfort for the patient obtains. During the early postoperative hours the bile, being allowed to escape externally fails to disturb the more or less parietic stomach. Under perfect control, in interrupted or continuous flow, the bile can be made to take its normal internal or its artificial external flow. Complete control of the vicious circle phenomena can thus be had. Failure of control is proof positive of faulty anastomosis and equally strong indication for prompt reopening. By this means I have to my sorrow, realized an angulation of efferent loop to exist and to successfully correct it. Through this tube can be introduced, *distal to the stomach*, such fluids as otherwise would have to enter through the mouth, anus or skin. If by the mouth, undesired and undesirable stomach peristalsis would be provoked. If by the colon with some discomfort and occasional failure of absorption. If by hypodermocleisis, slight influence on peristalsis is effected. Is there need of renal flushing abundant appropriate fluids can slowly and continuously be introduced to the best of all areas for absorption. Is there need of an alkali to correct an acidosis, here par excellence, is the point for its absorption. Is there need of food, dextrose solution, 2 per cent, combined or not with any desired liquid peptones is at command. Is there indication for a cathartic, here we can introduce the alkaline cathartic, sodium phosphate, with greatest benefit. Is there hemorrhage something can be done to bathe the bleeding areas with those fluids reputed to aid in blood coagulation, *e g*, calcium lactate or chloride, horse serum, adrenalin.

At this point a word of caution suggests itself as to the nature of the solutions one may not use through this tract. The mucosa of the cystic duct and common duct are normally bathed by an *alkaline* secretion. Failure to bear this in mind by instilling mildly acid solutions—*e g*, washing out the gall bladder with

weak Thiersch solution—resulted in such edema of the cystic mucosa as to occlude the duct for even a week. Use therefore *neutral* or *alkaline* menstrua. Fluids of high specific gravity crenate body cells; fluids of very low specific gravity cause them to swell; hence an effort to nearly approximate the density of the blood serum or bile in making up the solutions will render their use more facile and efficient. Fluids of slightly lower specific gravity than normal are to be preferred because more easily absorbed. When the biliary fistula is in the common duct with the tube inserted through it well into the duodenum after Matas' suggestion, then anything that can be borne by the duodenum can be inserted through it—e. g. milk soup, cathartics, medications—as he has demonstrated. Before beginning the first instillation it is highly desirable to wash out the gall bladder in order to be rid of any clots, thickened mucus, etc. that might interfere with the flow through the cystic duct. The fluids should be allowed to flow by gravity from an elevation of 12 to 20 inches. When working properly it causes absolutely no discomfort to the patient if controlled to the rate of flow of 5 to 10 drops per second. The amount that can be injected is practically only limited by the capacity of the intestines and blood vessels of the patient, which with too excessive hydration begin to show various edemas—lungs, serous cavities of hands and feet. This has begun to appear after the injection during a single night of between 3 and 4 liters. It did no damage and speedily disappeared on interrupting the procedure.

In conclusion I desire to invite your serious consideration of what I am sure you will at first thought regard as a complication rather than an improvement in the technic of gastric surgery to ask you to try it in your more serious and major surgical interferences with stomach integrity in preference to the simpler gastro-enterostomy for chronic pyloric stenosis. Then I am convinced you will find it if properly used rather a conservative detail than a surgical insult.

NOTE.—An extensive report of this work was recently made before the Minnesota State Medical Society and probably will be published in its journal.

## CLINIC OF DR. DEAN D. LEWIS

PRESBYTERIAN HOSPITAL

### NEUROLYSIS AND NERVE SUTURE

*Summary* Presentation of 4 cases illustrating the mechanism of the production and the results of injuries to nerves and the technic of the operations for repair. Necessity of early exploratory operation. Autoplastic transplantation of fat the best means of preventing the development of vicious cicatrix. Importance of preventing the overstretching of paralyzed muscles in the after treatment.

This patient, a colored male aged forty-three, was held up and shot January 14, 1916. The bullet entered the neck upon the right side at the level of the cricoid cartilage about the middle of the sternocleidomastoid muscle. The patient was unconscious for a few minutes and was immediately taken to a hospital, where the bullet was located by means of the x-ray, and was removed from the back, on the left side, near the posterosuperior angle of the scapula. Upon becoming conscious the patient stated that he remembered, immediately following the shot and before losing consciousness, the arm felt numb and hung limp like an empty coat sleeve.

The patient has not improved any as far as the use of the arm is concerned. He entered the Presbyterian Hospital October 3, 1916, for treatment.

The patient at the present time is unable to abduct the upper extremity, to flex or to supinate the forearm. Although unable to supinate the forearm, he has good use of the extensor group of muscles, which do not seem to have lost any power. An examination of the neck reveals a scar which indicates the point of entrance of the bullet, and a scar over the back in the position already noted which indicates the point of exit (Fig. 38).

The deltoid, supraspinatus, infraspinatus, biceps, brachialis anticus, supinator longus and brevis muscles are all paralyzed,

and there is marked atrophy of these muscles. There is no marked disturbance of sensation at the present time, although

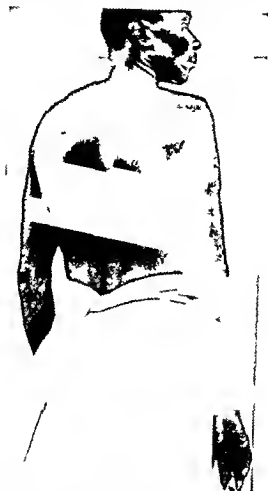


Fig. 38—Gunshot wound of brachial plexus showing wound of exit over the left scapula and atrophy of the muscles supplied by the nerves involved. The lateral trunk of the brachial plexus was injured. The muscles supplied by the fifth and sixth cervical nerves were the only ones affected.

there is some slight disturbance of sensation over the lower deltoid region and over the right thumb.

The muscles which are involved are supplied from the fifth

and sixth cervical nerves which unite to form the lateral trunk of the brachial plexus and judging from the fact that the loss of function came on immediately and was limited to the muscles supplied by branches from this trunk of the brachial plexus we have no doubt that we are dealing with a lesion of this nerve trunk fairly high up beneath the scalenus anticus. It is almost ten months since the injury. An exploratory operation should have been performed shortly after the injury for the prospects of improvement are better when an early operation is performed. Exploration in many of these cases is indicated. This procedure should I believe be advocated especially in civil life for the exact nature of the lesion cannot be determined in any other way and if the conditions indicate a certain procedure such as nerve suture or neurolysis the operation can be performed at a time when the prospects of recovery are the greatest.

Abundant opportunities have been offered during the recent wars to make an extensive and exhaustive study of nerve injuries. It has been found that in many cases in which paralysis has developed the nerve has not been completely severed. It has been contused or grooved and the functional disturbance which results is often due to the contraction of cicatricial tissue within or about the nerve.

In this case we will expose the lateral trunk of the brachial plexus because as I have already pointed out the distribution of the muscle atrophy points to the injury of this trunk. An incision carried down the posterior border of the sternocleidomastoid muscle and bending outward near the clavicle into the supraclavicular fossa should give a good exposure (Fig 39 1). After the posterior border of the sternocleidomastoid is retracted toward the median line the outer border of the scalenus anticus is exposed and emerging between it and the scalenus medius may be found the nerve trunk for which we are looking.

When this trunk is exposed there is found a good sized neuroma which can be dissected off from the nerve trunk proper (Fig 39 2 3). In this case it seems as if the bullet had grooved the outer part of this nerve and the neuroma which has formed does not involve the entire thickness or circumference of the

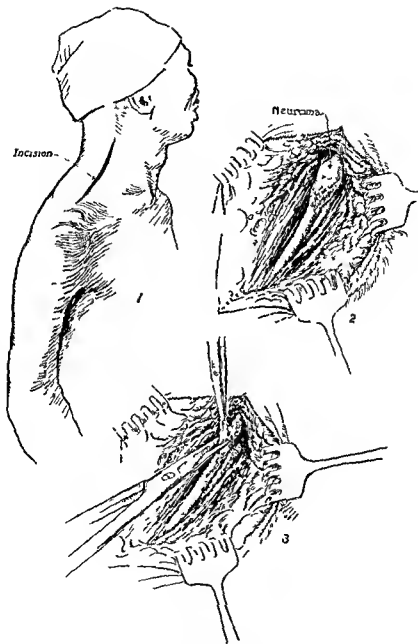


Fig 39

Figs 39 40 —Illustrating the incision and the different steps in the operation of neurolysis fat being used for this purpose on the lateral trunk of the brachial



Fig 40

plexus The incisions were made into the nerve (Fig 40, 4) to determine whether or not healthy axis-cylinders were present The source of the flap of fat is shown in Fig 40, 5



nerve I shall nick the trunk above the neuroma to see how far the scar tissue has extended. When the nerve is nicked just above the level of the neuroma healthy nerve fibers are exposed. I shall also make a superficial incision into the part of the nerve in which scar tissue has formed to see whether or not there are healthy nerve fibers. For the choice of operation depends upon the condition of this segment of the nerve trunk (Fig 40 4). There seem to be healthy axis cylinders in this intervening segment. Therefore I shall not attempt resection of this segment but shall resort to neurolysis the scar tissue forming the neuroma having been dissected off the nerve trunk.

That neurolysis may be decidedly beneficial is indicated by the cases observed by Hashimoto during the Russo Japanese War. But four nerve sutures and three nerve transplantations were attempted in the 50 cases operated on and observed by him. The results of the 3 cases of nerve transplantation were unsuccessful. In 43 cases neurolysis was attempted. The results were very good in 10 cases good in 15 satisfactory in 3 questionable in 4 and unsatisfactory in 11. In 7 cases neurolysis was attempted three hundred days or more after the injury. In this series the results were good in 4 cases questionable in 1 and unsatisfactory in 2. In 43 cases treated by neurolysis good results were obtained in 65 per cent or if the 4 questionable cases are included in 74.4 per cent. The results obtained by neurolysis after two hundred days had passed from the time of injury were doubtful. This operation is being attempted almost three hundred days after the injury and according to Hashimoto the prospects for complete recovery are not favorable.

Many different materials have been used for neurolysis. That no one has been uniformly satisfactory is indicated by the number that have been employed. Material used for tubulization after neurolysis must be capable of good sterilization must not act as a foreign body and must not contract adhesions with the nerve. Decalcified bone tubules iodoform gauze hardened gelatin tubes and hardened blood vessels of calves have all been used. Hashimoto used calves' arteries hardened in formalin after the method of Foramitti. In 1 case reported by Hashimoto ampu

tation became necessary four months after tubulization with a hardened artery was attempted. The hardened blood-vessel was almost entirely absorbed, only a few elastic fibers remaining in some places. Where at the first operation an avascular thickening was found, there was at the second operation a soft reddish segment abundantly supplied with blood-vessels.

I believe that at the present time there are but two materials which should be considered in this connection. These are fat and fascia. I have successfully used fascia to surround the line of suture in the radial nerve after resection and suture. This has been over two years, and there has been no interference with function from contraction of the fascia placed about the line of suture.

Recently there has been considerable discussion against the use of fascia for neurolysis. Kredel has been particularly emphatic against its use because of an experience he had in which the fascia was applied directly about a scar in a nerve. Contraction occurred in the fascia, necessitating a second operation. That good results may follow its use is indicated by the few cases which have been reported. Law has recently reported 2 cases of brachial plexus injury in which the line of suture was covered by free fascial flaps. There has been a continued improvement in these cases, with no evidence of cicatricial contraction of the fascia. Rowan, in a recent personal communication, relates the history of ulnar nerve suture combined with fascial tubulization in which there has been complete return of function. Against these successes may be mentioned the cases of Kredel and Goldmann. Goldmann placed fascial strips about the median and ulnar nerves. After six months the nerves had to be exposed because of impairment of function. The fascia was then found to be adherent to the nerves. Contraction of fascia will occur when this material is placed about recent scars. This limits decidedly the usefulness of fascia for neurolysis and tenolysis, for in the majority of cases scar-tissue in considerable amounts is encountered in conditions in which these operations are indicated.

Experimentally it has been shown that transplanted fat heals in position with little or no reaction of the foreign body type. There is but little leukocytic infiltration. In the early stages

transplanted fat becomes adherent to nerves about which it is placed. During regeneration of the fat the adhesions become less and less, and the fat either merely surrounds the nerve or is separated from it by a connective tissue zone of microscopic width. Eden and Rehn believe, as a result of their experimental work, that no other autoplasmic transplantable material contracts so few adhesions with tissues about which it is placed as fat.

I shall use fat to cover this nerve trunk, for it is the best tissue for this purpose. There is a branch which apparently passes into the muscle and I shall split the fat transplant to surround it. Both ends of the transplant will be fixed in position, so that it cannot slip down on the nerve trunk (Figs 40, 41).

In the after treatment a pull upon the paralyzed muscles should be prevented. A dressing will, therefore, be applied which will relax the paralyzed muscles, for relaxation of these during the process of repair is essential. This was pointed out some time ago by Thomas but has been much neglected by the medical profession especially in the treatment of anterior poliomyelitis.

Improvement in this case will be slow. It is difficult to estimate the length of time before there will be distinct evidences of improvement.

## CASE II

This boy, aged eight, was admitted to the Presbyterian Hospital October 24, 1916. The following history was obtained. The boy fell upon a piece of glass July 15, 1916. He was taken to a hospital where the wound was sutured. He remained in the hospital three and one half weeks. Nothing definite can be elicited concerning the injury. There is atrophy of the thenar group of muscles, and the muscles supplied by the ulnar nerve are also atrophied. A claw hand is beginning to develop. The scar passes transversely over the course of the median nerve just above the wrist and into the palm, over the course of the deep branch of the ulnar nerve.

Pressure just above the scar over the median nerve causes pain, and a neuroma can apparently be felt at this point.

An operation is indicated to determine the nature of the injury in this case and the character of the repair. An incision corre-

sponding to the course of the scar is made and the median nerve is readily found. Evidently an attempt had been made to unite the divided ends of the median, but a large neuroma has formed. This neuroma is resected, the resection being carried back into healthy nerve-tissue. In attempting to find the point of division of the ulnar nerve the dissection has to be carried into the palm, where the deep branch is found. The point of division is surrounded by a dense scar, and though an attempt is made to find a healthy portion of nerve to do an anastomosis, this is not entirely successful. The divided ulnar ends are sutured, but there is more scar-tissue in the distal segment than one would like. The suture lines in both the median and ulnar nerve are surrounded with free fat transplants. The divided flexor tendons had been united. Although these are somewhat matted together, no attempt is made to perform a tenolysis. The hand is dressed in flexion in order to permit of union of the nerve ends without undue tension.

NOTE.—This patient was seen December 6, 1916, and the cast removed. There seems to be some improvement in the lumbricales and in the interossei. This improvement is not marked enough, however, to permit of any very positive statements.

### CASE III

Here is a patient, a boy aged five and one-half years, who was admitted to the Presbyterian Hospital the 10th of October, 1916. A year ago last May the child sustained a compound fracture of the right femur, just above the condyles. The lower end of the upper fragment projected backward at the time of the injury. The fragments were placed in apposition soon after the injury, but during a change of dressing they apparently slipped somewhat, although there is even now no marked displacement or deformity. The extremity was immobilized twelve weeks, and when the cast was removed a drop-foot and atrophy of the anterior tibial group of muscles were noted.

There is nothing in the past or family history which has any bearing upon the present trouble.

An examination of the right knee reveals some limitation of motion. Flexion is good, but extension lacks about 10 degrees

of being complete. There is a scar over the back and outer aspect of the knee joint a little external to the course of the external popliteal nerve. This scar is evidently the result of a posterior displacement of the lower end of the upper fragment which pierced the skin at this point. There is marked drop foot upon this side and considerable atrophy of the anterior tibial group of muscles. There is some response to galvanic stimulation over the nerve but no response to faradic stimulation. Undoubtedly we are dealing with an injury of the external popliteal. It is difficult to state whether the injury has caused complete division or whether the nerve has been stretched over the bony fragment which projected posteriorly.

Loss or alteration of function in these cases may be due to secondary involvement in callus or to stretching over bony points in cases in which nerve is associated with bone injury. A scar fixing a nerve over a bony point may cause marked functional disturbance. In some of these cases paralysis develops late. Borchartt reports a case in which the paralysis developed two years after the removal of dead bone from the shaft of the humerus, the contracting scar causing the loss of function. In many of these cases freeing of the nerve from the scar tissue is enough to secure return of function, providing renewed compression from scar tissue can be prevented. We will expose this nerve to determine the nature of the injury. An incision is made parallel to the course of the external popliteal nerve. The dissection must be made through scar tissue. Below the uninjured portion of the external popliteal nerve is easily found running through the fibers of the peroneus longus. When this is traced upward we come upon a thinned cicatricial strand connecting an upper normal with a lower normal segment. This middle segment is evidently composed mostly of scar tissue. When incised but few normal axis-cylinders are found. If return of function is to be expected in this case the cicatricial intermediate segment must be removed and healthy nerve ends must be united. The intermediate segment will be removed, the resection being carried far enough up into the proximal segment until a granular cut surface indicative of normal axis cylinders is found (Fig. 41).

The leg must be flexed in order that the ends may be united without tension. I dislike to flex the parts in doing nerve suture, but believe that the chances of repair are much better after end-to-end suture than after lateral implantation into a neighboring nerve or after tubulization. Anatomic repair, as shown by Lewis and Kirk, is much more complete after end-to-end suture or tubulization than after lateral implantation. The flap methods of repair are not to be relied upon, as the results, as far as anatomic repair is concerned, are the worst of any method of nerve repair.

When the leg is partially flexed the nerve ends can be united without tension (Fig. 41, 2). But three sutures of fine silk are required to approximate the nerve ends. Owing to the large amount of scar-tissue the line of suture is surrounded by fat (Fig. 41, 3). The skin is closed with a continuous silk suture.

The leg will be immobilized in partial flexion for about twelve weeks, at which time repair at the line of suture should be well advanced. The leg will be gradually extended after that time. The foot will be dressed in dorsal flexion in order to relieve any pull upon the paralyzed muscles during the process of repair. The foot will be maintained in this position for many weeks, depending somewhat on the progress of the case.

#### CASE IV

Our next patient, a woman aged sixty-five, was admitted to the Presbyterian Hospital November 15, 1916. This patient gives a history of falling upon a broken china jar and cutting the flexor surface of the right forearm about 2 inches above the wrist. The wound was sutured shortly after the injury. Loss of sensation over the thumb and two and one-half fingers on the palmar surface were noted soon after the injury. Anesthesia was also noted over the area of distribution of the median nerve posteriorly.

The fingers and wrist were painful for seven weeks, at which time an operation was performed and the divided tendons sutured. No attempt was made to suture the median nerve.

When an examination was made at the hospital the two distal

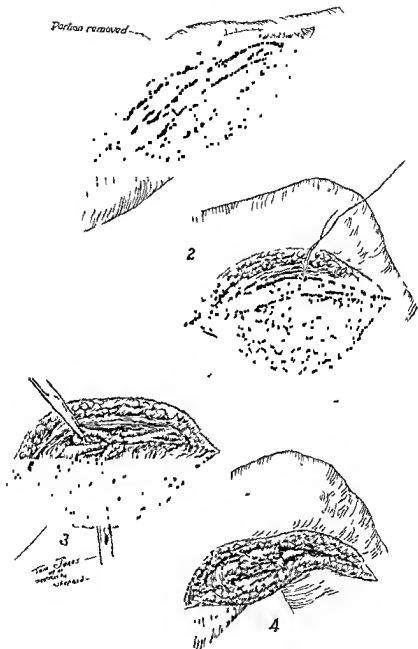


Fig 41 —Illustrating the different steps in the operation of nerve suture followed by neurolysis with a free fat transplant In 3 at A is seen the area from which the fat flap was taken

phalanges of all the fingers were flexed. These could be extended with difficulty because they were fixed at the wound above the wrist. Attempts to extend the fingers caused considerable pain. There has been some return of sensation to the parts previously anesthetic. The skin of the hand and fingers has the peculiar white, shiny appearance associated with nerve injuries.

The patient's chief complaint is of a severe pain which is so bad that the patient's general health has suffered. At times this is a burning pain, at other times sharp and lancinating, and at other times aching in character. It is so severe that the patient is willing to subject herself to almost any operation that will afford relief. No neuroma can be palpated over the course of the median nerve. The injury is probably so recent that a neuroma could not have formed.

The upper end of the median nerve is probably caught in a scar, which accounts for the severe almost continuous, pain.

A constrictor will be applied because an artificial ischemia facilitates dissection. A flap is turned back, exposing the structures upon the anterior surface of the forearm low down. This flap includes the original scar. The sutured tendons have a rather edematous, swollen appearance but evidently there is no infection.

The distal segment of the median nerve is readily found. The incision is prolonged upward in order that the proximal segment may be found before it enters the field of the original injury. When this segment is traced downward its end is found embedded in scar tissue, but no neuroma has formed. The end is dissected out of the scar, the scar tissue is resected until healthy axis-cylinders are found, and an end-to-end union is made, the wrist being somewhat flexed to permit of this. A fat transplant is placed about the line of suture and a large free fat transplant is placed between the different layers of flexor muscles.

The skin is closed with a continuous silk suture and an immobilizing dressing is applied before the constrictor is removed.

NOTE.—The patient left the hospital on the ninth day, healing having occurred by primary intention. She has been relieved of the constant nagging pain from which she sought relief.





## BLEEDING NIPPLE, WITH PLASTIC OPERATION UPON THE BREAST

*Summary* A patient complaining of the discharge of bright red blood from the right breast, clinical significance of a bloody discharge from the non lactating breast, differential diagnosis of chronic cystic mastitis, plastic operation for the cure of chronic cystic mastitis This operation best adapted for patients in whom the fat tissue of the breast predominates over the glandular elements

*November 4, 1916*

THIS patient, Mrs S H, aged forty-two, was married when nineteen years of age. She is the mother of five children. She was operated upon five years ago for gall-stones. There is nothing in the past or family history which has any bearing upon the present trouble.

Six months before entering the hospital the patient noticed a blood-stain upon her night gown where it touched the breast. She wondered where the blood came from, and upon squeezing the right breast bright red blood was discharged. She had noticed no pain in the breast and had received no injury of the same. When the first baby was born an abscess formed in the right breast which required lancing.

During the past six months blood has been discharged from the nipple almost constantly, although the amount has varied considerably. The gauze worn over the nipple was always blood-stained. Sometimes the blood was bright red, at other times dark and granular, the blood having decomposed.

The clinical significance of a bloody discharge from the nipple of a non-lactating breast has been variously interpreted. A scanty, thin, sanguinolent discharge has usually been regarded as suggestive of a malignant growth; a mucoid discharge, of a benign growth, and a markedly bloody discharge, of an intracanalicular papilloma. Bloodgood believes that a discharge from the nipple, except during lactation, may be looked upon as a sign of a benign lesion and not as a symptom of cancer. If the discharge is serous

or bloody it is a positive sign of an intracanalicular papilloma. In senile parenchymatous hypertrophy there can often be expressed from the nipple a thick brownish material which the patient rarely observes which is formed by the accumulation of the products of degenerated epithelium.

The pathologic changes associated with the escape of a serous serohemorrhagic or hemorrhagic discharge from the nipple have many interesting features and must be kept constantly in mind when attempting to make a diagnosis. The lesions most frequently associated with a serohemorrhagic or hemorrhagic discharge from the nipple are regarded by some (Kaufmann) as rare but most surgeons can recall some few cases of bleeding nipples most of which have not been carefully analyzed. The pathologic changes associated with a hemorrhagic discharge have been so variously interpreted and have received such a variety of names—such as *encysted medullary carcinoma*, *cystofibroma*, *villous carcinoma* and *duct cancer*—that it is often impossible to determine whether the lesion which is described is benign or malignant. It is quite evident that the term *duct cancer* which was applied in former years especially in England to the papillomas in the ducts which are found superficially just beneath the areola and which are so frequently associated with a bloody discharge from nipple is a misnomer for the majority of these are benign and although some may be possessed of malignant potentialities they remain for years without changing their benign characteristics.

In making a diagnosis of the change in the breast under consideration the common intracanalicular papilloma can be ruled out. These are usually situated superficially beneath the areola the duct being dilated to form what might be called a cyst in which blood and the papilloma are found.

I can best illustrate this type of lesion by quoting from the history of a patient upon whom I operated two years ago. This patient forty six years of age had noticed for eight years an intermittent serohemorrhagic discharge from the left nipple. The discharge had recurred at periods of from four to six months during these eight years would last some time and then disappear

For nine weeks before entering the hospital the discharge had been almost continuous. Two weeks before the patient had noticed a small swelling about the size of a hazelnut situated superficially just beneath the areola to the inner side of the nipple. This swelling developed rather quickly. When pressure was made over this swelling a stream of serohemorrhagic fluid at times almost pure blood was discharged from the nipple the size of the swelling being greatly reduced. This case is cited as it indicates the common position of the intraductal papilloma the lesion most frequently associated with a discharge of blood from the nipple.

This patient's breasts are large and pendulous and when both are palpated they have a peculiar irregular shotty feel. No serohemorrhagic or hemorrhagic material can be discharged from the nipple when pressure is made upon the left breast. When pressure is made upon the right breast the pressure being applied upon the different quadrants separately a dark brown hemorrhagic material is expressed from the nipple.

The involvement of both breasts and the fact that a bloody fluid can be expressed from all parts of the breast makes the diagnosis of chronic cystic mastitis almost certain. There are no clinical evidences of malignancy. A small papilloma situated deep in the ducts of which I have recently seen two examples will give rise to a bloody discharge from the nipple but blood can be expressed only when pressure is made upon the parts of the breast immediately adjacent to the tumor and in the two instances which I mentioned the breast involved did not have the peculiar shotty feel so characteristic of the adenocystic type of chronic mastitis.

There are no evidences of malignancy in this case and I desire to remove the glandular portion of the breast and to leave the fat from which the breast can be reconstructed. The operation which I shall perform in this case can be used to advantage when the breast is well developed and in middle aged patients in whom the fat predominates. I have performed this operation in a girl nineteen years of age with cystic mastitis but the glandular tissue greatly preponderated over the fatty and the breast

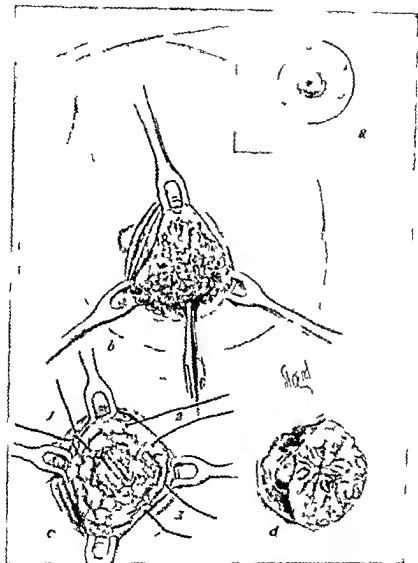


Fig 42—*a* Line of incision *b* areola *c* sectioned up milk-ducts cut and gland being separated from the surrounding fat tissue *c* purse string sutures inserted preparatory to obliterating the dead space and reconstructing the breast *d* purse string sutures tied areola about to be stitched back in place

from which the glandular substance was removed is flattened and much smaller than the other I believe that this operation is

better than complete removal even when the breasts differ so much in size after the operation. If both breasts are involved the operation gives very satisfactory results.

The incision is made at the junction of the areola with the skin to the inner side of the nipple, as illustrated in Fig 42 at *a*.

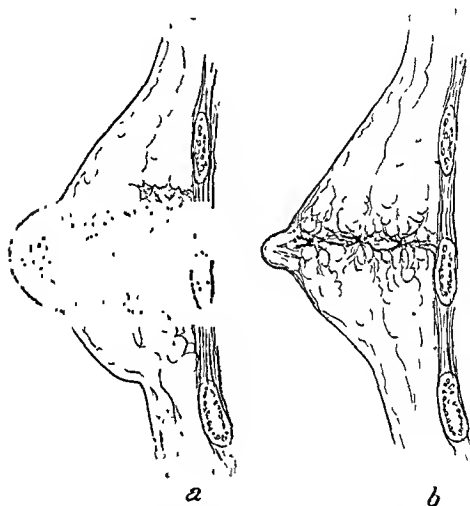


Fig 43—*a, b*, Diagrams illustrating the manner in which the surrounding fat tissue is made to fill in the space left by the removal of the glandular tissue

The areola is then dissected up and the milk-ducts cut as they enter the nipple. The glandular tissue of the breast is then grasped with artery forceps and is gradually pulled out, the dissection being carried on between the glandular tissue and the fat

(Fig 42 *b*) The entire glandular substance of the breast can be removed in this way. After the glandular substance has been removed purse string sutures of catgut are placed through the fat from below upward. Usually three purse string sutures are enough to reconstruct the breast (Fig 42 *c* and *d*). Compare also Fig 43 *a* and *b*). The skin flap containing the areola is then



Fig 44—Sect on of adenocyst type of chronic cystic mastitis. A serohemorrhagic discharge from the nipple was the first symptom which attracted attention to disease of the breast.

sutured back in position. I have not used a drain in these cases. There has been considerable discharge of serum which has been rather annoying and I believe that it would be best to use a small gutta percha or cigarette drain.

The glandular substance which I have just removed is fairly riddled with small cysts, some of which contain a bloody others

a serohemorrhagic, and still others a mucoid, material. There are no gross evidences of malignancy, nothing even suspicious of malignancy, and I believe that we are dealing with the adenocystic type of chronic mastitis associated with a discharge of blood from the nipple. I shall remove pieces from a number of different parts of this breast in order that a careful microscopic study of the tissue can be made (Fig 44).



Fig 45 —The glandular tissue of the right breast was removed by the plastic operation which has been described. The depression to the inner side of the nipple indicates the position of the incision through which the operation was done.

Bloodgood, in a personal communication, makes the following statement concerning the discharge of blood from the nipple. His cases are divided into the following groups:

*Group A* —Cases in which women have had a discharge of blood from the nipple without the finding of any tumor. This group can be divided into two classes. *Class I.* Two cases have been operated upon. The breast was removed in these 2 cases and a simple papillomatous cyst containing blood was found. One case was operated upon fifteen years ago, and the other five years ago. Both patients are well and without recurrences.



Class II No operation performed He has had about 5 or 6 of these cases In all but 1 the blood has disappeared, no tumor has developed, and the patients have remained well In 1 case a tumor developed three years later and was removed It was a cyst with a papilloma, and there had been no recurrence after a period of about two years

*Group B*—Discharge of blood from the nipple associated with a papillomatous tumor All of these cases have been operated upon, and in all a papillomatous cyst has been found The majority have been benign He thinks that in only 1 or 2 cases which were malignant was there a discharge from the nipple From his experience he finds that discharge from the nipple alone is not an indication for operation

Bleeding nipples are most frequently associated with intracanalicular papillomas and the adenocystic type of chronic mastitis The papillary growths occurring in the acini and ducts are essentially the same, and the papillary cystadenomata should be regarded as a part of abnormal involution, although not necessarily a late stage

## CONGENITAL PYLORIC STENOSIS

*Summary* A patient presenting characteristic symptoms of congenital pyloric stenosis, differential diagnosis—pylorospasm, shortened peritoneal fold kinking duodenum, and tumor projecting into pyloric canal may simulate congenital pyloric stenosis—both rare, when to operate, results of operation, superiority of the Rammstedt pyloroplasty, technic of the operation, after treatment as compared with that following gastro enterostomy

*October 28, 1916.*

THIS girl baby is eight weeks and four days old. She was born August 29th, at which time she weighed 6 pounds. Ever since birth there has been considerable regurgitation of food. When four weeks old she weighed 6 pounds and 4 ounces, having gained 4 ounces in four weeks. At this time projectile vomiting was noted and distinct peristaltic waves, although no tumor could be palpated. During this time the baby has been under the care of Drs. Skiles and Helmholtz, and in spite of changes in the character of the feeding there has been a progressive loss in weight, so that now, five weeks and two days since the beginning of projectile vomiting and the appearance of peristaltic waves, the baby weighs but 5 pounds and 4 ounces.

This baby presents symptoms which are characteristic of congenital pyloric stenosis, the diagnosis of which is usually regarded as easy. In the majority of cases the diagnosis can be easily made, but it is rather difficult to state just why this is so. It is probably due to the fact that at the age when the symptoms of congenital pyloric stenosis make their appearance there are few conditions presenting themselves which simulate it. Certainly age is a factor in the diagnosis and one on which considerable stress must be laid. The symptoms usually begin about the third week after birth, continuing until the child dies or improves under appropriate treatment. It is not unusual to see the symptoms of congenital pyloric stenosis begin still earlier, but it is rather unusual to find an untreated case in a child more than three months of age. This condition, therefore, occurs very

definitely in a period between the third and twelfth weeks. It occurs much more frequently in males—14 of the 16 cases which I have observed have been in males.

The symptom which first attracts attention is vomiting. The vomiting frequently begins in the early stages as regurgitation, which becomes gradually worse, until within a few days or weeks it becomes distinctly projectile in character. The quantity vomited at any given time depends to a large extent upon the period of time which has elapsed since the last vomiting. At times these infants will go eight to twelve even twenty four hours without vomiting at the end of which time there is projectile vomiting and a large amount of fluid is ejected with much force. It is not unusual to see a child vomit a distance of 2 to 2½ feet. The time at which the vomiting occurs may be from a few minutes to several hours after the ingestion of food. Nothing about the character of the vomitus is distinctive. The character depends somewhat upon the length of time that the food has remained in the stomach. This statement should be modified to an extent, for at times a large quantity of watery fluid may be ejected after the stomach has apparently been emptied by previous vomiting. Of all the symptoms vomiting is the most alarming.

Accompanying the vomiting and a direct result of the same is a decrease in the amount of feces. This has been called a constipation but in the true sense of the word it is not, but is due to the reduction in the amount of material reaching the bowel. There is also a decreased absorption of water and a concentrated urine is passed in small amounts.

The general condition of these infants is often strikingly good when one takes into consideration the degree of the starvation resulting from the vomiting. They practically never have the brownish or grayish hue which is so frequently observed in cases of marasmus of the same degree of emaciation. The skin is nearly always clear usually pale, and the subcutaneous tissues show a depletion in proportion to the severity of the vomiting. They are not the disturbed and irritated infants such as are seen in gastro intestinal disturbances. They are extremely hungry, but only a small proportion of the cases suffer from an accumulation

of gas. The sleep is not disturbed and is usually sound, in this way differing markedly from the sleep of children suffering from nutritional disturbances.

The weight curve is of interest. It is not uncommon to have a history of a weight curve which, following the initial loss after birth, has a steady though not marked upward trend. This satisfactory weight condition continues but a short time after vomiting begins. The curve then tends to become stationary. If the case is being watched carefully there is apt to come a time when the loss in weight is much more rapid than it had been previously. This rapid loss is a danger signal, and when this occurs operative procedure must be considered.

The baby before us has, as stated before, all the symptoms of congenital pyloric stenosis. The projectile vomiting began at the time at which it is usually noted; the peristaltic waves are distinct; there is distention of the epigastrium, but I have been unable to palpate the tumor, and often I have been unable to do this even when the operation revealed a good-sized mass at the pylorus.

Concerning the differential diagnosis, Grulee states that the chief difficulty is in differentiating between stenosis and pylorospasm. A severe case of pylorospasm may simulate very closely congenital pyloric stenosis. In most cases of pylorospasm there are a few points which are very significant. It is not unusual to find pylorospasm beginning during the first few days of life. This is rather unusual in congenital pyloric stenosis. While congenital pyloric stenosis appears before the third month, pylorospasm is often observed in much older infants. It is not infrequently seen in children seven, eight, and nine months old. In most cases of pylorospasm there is a definite history of previous gastro-intestinal disturbance, usually dyspeptic in nature. In infants a few weeks old with pylorospasm the vomiting, epigastric peristalsis, etc., are much less marked than in a case of congenital pyloric stenosis of the same age. The symptoms of pylorospasm tend to increase in severity as the child becomes older, but the increase is not nearly so rapid as in congenital stenosis. The x-ray findings offer nothing which will differentiate between the two conditions.

Two other conditions must be considered in the differential diagnosis. These are so rare that they need only be mentioned. A shortened peritoneal fold may kink the bowel just beyond the pylorus. Such a case has been described by Grulee and Kelly. In these cases there is usually some cessation in the severity of the vomiting and biliary vomiting is rather common. Grulee has seen 2 such cases, since he reported his first one. Downes has



Fig 46—Illustrating condition of pylorus nine months after a successful gastroenterostomy for congenital pyloric stenosis (Lewis and Grulee)

reported an interesting case in which a small tumor projected into the pyloric canal and caused symptoms which simulated closely those of congenital stenosis.

If the baby is losing ground after appropriate medical treatment has been tried, an operation for relief of the stenosis should be performed. Lewis and Grulee have had the opportunity of studying the condition of the pylorus two hundred and fifty six

days after a successful gastro-enterostomy. This gastro-enterostomy functionated perfectly, but two hundred and fifty-six days afterward the hypertrophy of the structures about the pyloric ring was as marked as at the time the operation was performed (Fig. 46).

A few years ago the results of operation for congenital pyloric stenosis were so uncertain that physicians hardly felt justified in recommending surgical treatment. The high mortality even at this time was not entirely due to the operative technic employed, for many of the cases were not recognized until they had become poor surgical risks, and even when recognized early medical treatment was continued so long that the infant was turned over to the surgeon for operation as a last resort.

In 1906 Thompson found recorded in the literature 156 cases of congenital stenosis. To these be added 1 of his own, making 157. The total number of operations performed up to that time was 89. These may be summarized as follows:

	Number	Recovered	Died	Mortality.
Pylorectomy	1	0	1	100 per cent
Divulsion	17	8	9	53 "
Pyloroplasty	12	6	6	50 "
Gastro-enterostomy	59	59	30	51 "

Since this paper was published the mortality has been greatly reduced. Only two of a number of operative procedures have proved to be sufficiently satisfactory to warrant adoption. These are posterior no-loop gastro-enterostomy and pyloroplasty. The largest series of cases which have been operated upon are those of Downes, Richter, and Scudder. Posterior gastro-enterostomy was originally employed by each of these surgeons, and the mortality was 32, 14, and 24 per cent. respectively. The total number of cases in the early series was 61, with a mortality of 22 per cent.

I have operated upon 16 cases, 3 of which died, the mortality being 18.7 per cent. In 12 of the cases a posterior no-loop gastro-enterostomy was performed. The first 5 babies recovered. The sixth baby died of peritonitis following opening of the abdominal wound on the fifth day. The convalescence up to this time had been especially good, and at the autopsy the gastro-enteros-

tomy proved to be well advanced in the process of repair. The seventh baby died at the end of a week from perforation of the gastro intestinal anastomosis. The eighth baby died after forty eight hours, and the cause of death could not be determined when the autopsy was performed.

In the last 4 cases a Rammstedt pyloroplasty has been performed, and I believe that it is much superior to the posterior gastro enterostomy. But little time is required to perform the operation, there is less manipulation, and the babies recover much more rapidly than after gastro-enterostomy. If care is exercised there is not much danger of cutting the mucosa. The greatest danger of perforating the mucosa is on the duodenal side of the pylorus where the enlargement often ends somewhat abruptly. In the fourteenth case in which a Rammstedt was employed I perforated the mucous membrane but this happened on the duodenal side and the opening could be closed. The baby made a good recovery.

The operation is very simple. After opening the abdomen the pylorus is found and the enlargement is grasped between the thumb and index finger and delivered. An incision is made into it parallel to the axis of the bowel down to the mucosa which bulges into the incision (Fig 47). The opening is then enlarged by spreading the margins which separate easily from the underlying tissue with artery forceps (Fig 47 A). No attempt is made to cover the mucosa. The hemorrhage from the cut surfaces which is not great, can be easily controlled by a hot pack or by transfixion.

Special attention should be paid to suturing of the abdominal wall. An incision through the right rectus heals better than one through the linea alba. After careful layer suture and the application of a dressing we wrap the entire abdomen from the margin of the ribs to the pubes with adhesive. A number of surgeons have spoken of the opening of the abdomen in these cases, and special care must be exercised against this accident.

The Rammstedt pyloroplasty has been employed by Downes in 35 cases. Eight deaths occurred in this series giving a mortality of 23 per cent.

Shock has not been noted after either gastro enterostomy or pyloroplasty. This has been mentioned by a considerable number of operators as being quite common after gastro enterostomy. This lack of shock we believe to be due to the skill with which the

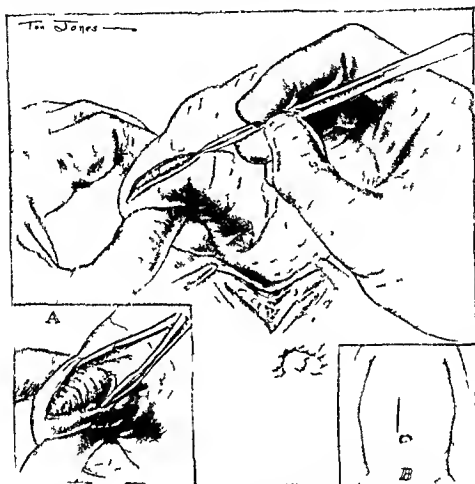


Fig 47—Illustrating steps in the Rammstedt pyloroplasty. The method of holding the pylorus between the thumb and finger and the site of the incision. Insert A the lips of the incision are being spread with artery forceps. Insert B rectus incision to right of median line.

anesthesia has been administered by Dr Isabella Herb ether being used. The anesthesia has been light but still deep enough to permit of doing the anastomosis without difficulty and without forcing the intestines out of the abdomen.

Dr C G Grullee has taken care of the postoperative treat



ment The babies upon whom a gastro enterostomy is performed have a hard time during the first thirty six to forty eight hours The babies upon whom a pyloroplasty is performed recover very rapidly In the after treatment of the gastro-enterostomy cases Dr Grulee has attempted to give the babies water by mouth within six hours after the operation This is followed within two hours by a small amount perhaps  $\frac{1}{2}$  ounce of breast milk Vomiting of a small amount of greenish liquid has almost always followed these attempts This greenish fluid rarely contained the milk which had been ingested or curds of the same

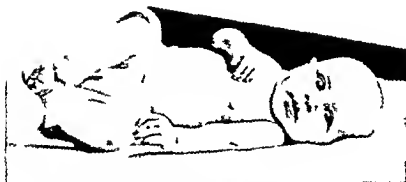


Fig 48 —Baby upon whom a Rammstedt operation has been performed The baby has gained  $4\frac{1}{2}$  pounds in eight weeks

These cases have never been fed oftener than every four hours the quantity of food being gradually increased from  $\frac{1}{4}$  to  $\frac{1}{2}$  ounce Depending upon the severity of the case and the persistency of the vomiting it has required from one to two weeks to get the child on the required amount of food Often the child is so depleted as the result of the disease that it is necessary that the fluid contents of the body be kept up A continuous normal saline solution given rectally has proved of value in several cases In some cases it has seemed best to give feedings by rectum For this purpose the only food that can be considered is breast milk

When this is attempted the routine is about as follows. A feeding of  $\frac{1}{2}$  to 1 ounce of breast milk is given rectally. In two hours 2 or 3 ounces of normal salt solution, in two hours again the rectal feeding, and so on. There has been with this procedure much less irritation of the bowel than we had expected.

After the Rammstedt pyloroplasty, in contrast to the above conditions following gastro enterostomy, the ordinary feedings may be continued.



## CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

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### OPEN WOUND TREATMENT OF ACUTE AND CHRONIC BONE AND JOINT INFECTIONS: CLINICAL TALK WITH DEMONSTRATIONS OF THREE CASES

*Summary* (a) Extensive tuberculosis of elbow joint with bone destruction—resection of all diseased tissue wound packed wide open, no suture, healing with but little deformity and satisfactory mobility

(b) Neglected felon—open treatment—recognition of dead bone at operation

(c) Osteomyelitis of jaw secondary to infected molar, open treatment

Philosophy of the open wound treatment—disadvantages of gauze and tubular drainage—adhesive plaster to promote growth of skin over raw surfaces—results obtained by Dr Alexis Carrel in the military hospitals of France

THE cases which I am presenting to you are illustrative of a method which is not universally used, but which is very successful in the treatment of bad acute and chronic inflammations of joints and bones

This patient, an Armenian, eighteen years old, has been in this country only a short time, working as a factory hand. Although living in a very healthy climate of Armenia, he was afflicted in his youth with a number of boils, and has had several small operations for the same in his home country. He does not remember that he ever had any important or severe malady. He uses neither alcohol nor tobacco, does not cough, does not perspire at night, but has lost considerable flesh, especially during the last two years since his present trouble began. He worked then in a barbers' school, learning the trade for two months, when his elbow began to swell. He went to a hospital, where the elbow was incised, pus discharged. At the same

time a swelling of one of his ribs appeared, which also was incised and pus discharged. Part of the rib was removed. The wound on his chest healed perfectly, but the arm never healed. Another operation like the first one was performed. His arm however, began to swell more and more in the elbow region. It became stiff at an angle of about 70 degrees and while it did not pain very much, the constant suppuration brought his



Fig. 49 —The arm as it came under our observation draining fistula and ulcerated surface seen

health down to such a point that he was sent to the hospital for incurable tuberculous patients at Oak Forest. There an amputation was proposed above the elbow, but was refused, whereupon his physician sent him here for consultation and treatment.

The idea of the doctor in sending him was that possibly through the use of bismuth paste or some other means the arm might be saved. At first glance this seemed hardly to be hoped for. The elbow was enlarged to considerable size, the skin glis

tening and congested. There was a thin discharge mixed with a few flakes of pus, while dead tissue and some anemic granulations were seen protruding from a number of fistulous openings. The arm had lost its motility and the muscles were atrophied from non-use (Fig. 49). The lungs and heart seemed to be normal, but the boy's general condition was pretty bad.

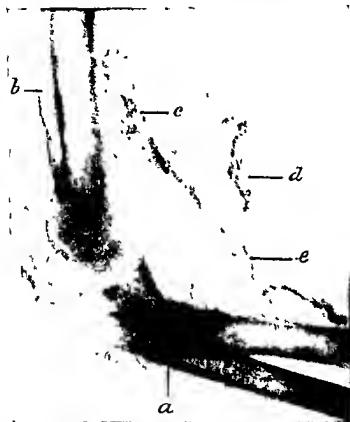


Fig 50—Elbow injected with bismuth paste, showing the different directions of the fistulae connected through the bismuth paste. The bone lesions are also well shown.

The x-ray pictures at that time, following the injection of bismuth paste, showed the elbow-joint destroyed (Fig. 50); the process of the disease having produced an absorption of a great deal of the bony substance in the humerus, radius, and ulna, associated with areas of new bone formation (*a*), and marked thickening of the periosteum (*b*). The changes at *a* and *b* remind one of the possibility of syphilis (syphilitic periostitis), but

are not to be regarded as characteristic of that disease. Fistulous tracts as demonstrated by the shadows of the masses of paste (*c*, *d*, *e*) are seen running in different directions through the granulomatous tissue. No sequestrum of distinct character can be distinguished.

A Wassermann reaction was double plus result with two control tests, nevertheless there were no other syphilitic symptoms present, and large doses of potassium iodid did not bring about any improvement.

Operation November 17, 1915. After applying an Esmarch constrictor an incision was made over the external surface of the elbow long enough to expose the whole pathologic process, by a forced flexion the joint was immediately opened and all the nooks and corners of the diseased bone exposed. With a sharp spoon and with cutting forceps everything that seemed diseased was removed, including part of the radius and a good sized piece of the end of the ulna, while the ulna was rounded off clear down to healthy tissue. Thus left quite an extensive wound, which was enlarged more by a transverse incision of the skin so as to expose every possible focus. The wound was packed with gauze and bandaged tightly.

There was very little secondary bleeding through the bandages. The large surface covered itself very soon with granulations which looked ugly for some time, because the necrotic portions of the bone were sloughing superficially and some of the soft tissues also (Fig. 51), but gradually began to look healthier, and after a few months of steady improvement the wound healed. Motion began to set in and now, except for the scar the elbow appears perfectly normal.

As an illustration of a second case treated in the above manner I present this patient, a young working girl of twenty years, who about a month ago contracted an infection of her right thumb, which later developed into a felon. This felon was incised and a quantity of pus escaped. The incision did not heal, but has continued to discharge pus ever since.

The x ray pictures made at this time show a ragged, dull end phalanx. A probe inserted into the wound impinges upon

rough, bare bone. Our diagnosis, therefore, is a necrosis of the phalanx.

This case is representative of many similar cases. They are, as a rule, self-limiting, but it takes a good long while to exfoliate the dead tissue. It takes, in the first place, a good long time, perhaps weeks, for the separation of the dead and healthy



Fig 51 —Wound at the first dressing, open, showing the extent and the drainage, the bones exposed in the center

bone and the escape of the former, the dead soft tissues slough out in little particles which are washed out daily, and when the process clears up the skin closes over that wound with a retracted scar and the nail grows like a claw over the end of the thumb.

Every surgeon is familiar with this result of a felon of the thumb in particular, but also of the other fingers. The pro-



cedure to cut that healing short which is of great importance for this patient is the open treatment quoted above We cut the thumb open the wound wide and expose the bone Is this bone dead? We take a cutting forceps and cut off the end of the phalanx We see that the cut surface is white and dry We cut a little more and we see here and there a bleeding point but most of the surface is dry We cut still a little closer to the first joint and we find that the bone is bleeding That is healthy bone We stop cutting away now clean the wound of its granulations and pack it with gauze We shall expect this wound to granulate and heal quite promptly

A third illustrative case is that of this young man with a necrosed jaw which necrosis has its origin in an impacted wisdom tooth An abscess developed here which was opened and drained by a physician but as there was no attempt made to remove the diseased or dead bone the abscess recurred each time the drainage opening healed over

Today we enlarge this opening on the side of the face clear down to the necrosed bone and remove it with the impacted tooth Now the whole cavity produced by this operation is packed with gauze as in the other two cases The packing will be renewed at intervals and the wound will be made to heal from the bottom up

It is important first to remove the whole pathologic process second to provide a sufficient external opening and third to maintain the external wound open by gauze packing changed at appropriate intervals until the whole cavity has filled in from the bottom We have followed this procedure in a large number of cases of osteomyelitis of the long and short bones and in connection with many diseased joints and we regard the results as highly satisfactory

The history of the cases which come to us is always the same The first physician whom the patient consults assists nature by making some incisions short and insufficient to give the pus a chance to discharge from the body I always compare these conditions to a bottle the incised wound being the neck and the deep lying pathologic process the belly of the bottle Through

such small openings many surgeons try to remove pathologic tissues with spoons and irrigations, without ever being able to look into the wound and so assure themselves that the dead tissue is removed in its full extent. They can work only in the direct line of their spoon and cannot get around corners, and therefore they frequently leave cavities, recesses, and pockets, with the resultant fistulæ. Bolder and more progressive surgeons open such wounds, expose them thoroughly, remove all the pathologic tissue which they can find, but they close up the surface, leaving only one or two points of exit for those tissues which become necrotic after the operation, or which, though necrotic, might have been left behind. In many instances, especially where the process has been relatively acute, this method will lead to perfect success. Every once in a while, however, infected tissue will be enclosed by the rapidly healing skin and then look out for fistulæ.

In quite a number of cases in which one or several operations have been performed with the removal of dead or diseased tissue, fistulæ have remained. These we have treated by the injection of bismuth paste, which has led in many instances to permanent closure. The function of the paste in such cases seems to be that of assisting in the filling of the cavities which could not otherwise be obliterated and which would have drained until obliterated.

The method which we employed in the case of this young Armenian is, in my estimation, the only safe way of dealing with such extensive cases. Tubes or gauze as safety valves and as drainage routes have many disagreeable features. They often allow incomplete discharge, the damming up of the discharges causing retention with fever, because gauze and tubes cease to be capillary or hydrophil when they are clogged up with material. We often find when we remove these drainage-tubes or strips of gauze that the fluid which has been dammed up behind them escapes in a gush and the patients who have been running a temperature become free of fever and pain. The appearance of healthy granulations on such large wounds is the only proof of their health and the absence of any disease behind them. One should, however, not be deceived in this as granulations grow very rapidly and often cover a hidden sinus, but they never close

entirely and permanently if there is such a disease behind them. We observe rather that in some spots in which the opening is not very clear there is an appearance of some pus or serous discharge, and if we closely examine these spots we will find that they often lead to a hidden sinus. This is all a matter of experience and close observation.

Occasionally, after the cavity has filled in, we will be confronted with large skin defects, which, left to themselves, may take weeks to heal. In such instances we can skin-graft or, still better, we can use a method which has given us a great deal of success, namely, the use of adhesive plaster, under which epithelization takes place very rapidly. This is a new method which is not universally known, but which has been used extensively in this city by Dr. Charles A. Parker<sup>1</sup> and others in the treatment of granulating surfaces, especially those following burns. It seems that the adhesive plaster prevents the elevation of the granulations over the borders, and that it keeps the epithelium propagating or growing better from the border, so that under the adhesive plaster new epithelium rapidly grows out over the granulations, covering the defect in a relatively short time.

Incidentally, I may say that this method of open treatment of large wounds of this character may also be applied very satisfactorily to fresh wounds, such as appear now in large numbers as a result of the present war. I am in close communication with my former associate and friend, Dr. Alexis Carrel, who holds a position in a hospital in Compiègne, France, close to the front. Connected with the hospital is a small institute of research modeled after the Rockefeller Institute, in which he has been an active worker. I have sent him pictures of my experiences with open wounds, and have received from him reports of his very extensive experiences in the treatment of wounds caused by shrapnel, explosives, and other methods of warfare. The wounds of bones and joints which come to him are almost invariably infected. Carrel lays these wounds open and irrigates them continuously with Dakin's solution until they become perfectly sterile. He has

<sup>1</sup> Parker, C. A., Jour Amer Med. Assoc., 1915, lrv, p. 14

kept close watch on the number of bacteria to the unit, and has mathematically ascertained that these infections grow from day to day less in quantity until they disappear entirely. He can then by the curve (Fig. 52), by which is recorded the results of the daily investigation, judge the nature of the wound and the possibility of early closure. In acute processes of this kind I think

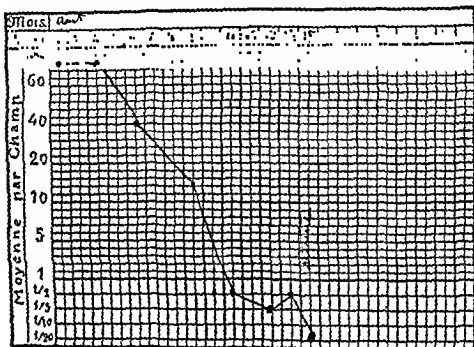


Fig. 52.—This curve, prepared by Dr. Alexis Carrel, has been sent to me to show the falling off in the number of bacteria in the wound while under treatment. Treatment by irrigation with Dakin's solution was begun on August 2, 1916. On August 15th the wound was bacteria free.

his method is excellent. In chronic processes, such as those with which we have dealt today, I think Carrel's method of investigation and treatment would be of no value. We know that such wounds remain infected until the last day of closure, and that the granulations which have developed have finally become so resistant that we could even put a culture of infectious material right upon their surface and it would do no harm.



## NEW TREATMENT OF LARGE CAVITIES AFTER EMPHYEMA OF THE CHEST: DEMONSTRATION OF A CASE AND CLINICAL TALK

*Summary* History of patient—failure of Estlander Schede operation Dr Beck's operation causes of persistent empyema cavities diagnosis with x ray and bismuth paste, complications danger of the suction treatment treatment of bronchial fistulae Dr Emil Beck's method cases suitable for the Schede and Estlander operations importance of leaving portion of chest wall posteriorly when doing radical operation for cure of large cavities following empyema

Miss F. L. at age of four had measles and pneumonia, with pleurisy, at the same time had an attack of appendicitis. Was fairly well up to the age of nine, when she had again an attack of pleurisy followed by empyema. This was operated upon and drained. The drainage was kept up until she was fourteen years old at which time it closed. She had fever again for five weeks. The cavity on right side was opened again, pus discharged, the wound healed, but a month later closed again, had fever, and wound opened once more. When wound closes she has fever and chills and when it is draining she feels well with exceptional coughing spells.

Patient's condition in May, 1915. Fever,  $102^{\circ}$  F., retention of yellow thick pus which drains only through a very small opening, x ray examinations show the right chest cavity almost entirely filled with pus, the lung very much retracted to a small dense, flattened tissue around the apex. A large incision is made alongside the sixth and seventh ribs, a portion of these ribs excised and a drainage tube inserted (Fig. 53). This condition, however, does not improve the general status. Patient, while gaining in weight on account of the free discharge, has no tendency to obliterate the chest cavity (Fig. 54).

In February, 1916, an extensive operation was performed, all the ribs were removed up to the third in front and to the axillary line (a modified Estlander Schede operation).

Chronic suppurations from intractable empyema of the chest are quite common. The patients have become used to their trouble and if the balance of the loss through suppuration and their gain through nourishment and good hygienic condition is in favor of the patients they get along very nicely with such a chronic suppuration.

I have seen cases which lasted fifteen and twenty years and have grown so accustomed to their tube and their discharge that they do not find it any discomfort and would be unhappy without it but that is not the case with the majority. Most of the people if they have no discomfort feel much annoyed by the constant pus discharges which at times have an offensive odor.

Can we cure these cases? There have been many attempts made by surgical and non surgical methods to obliterate these cavities. Let us ask. What is the cause of these chronic suppurations? The first cause is a mechanical one namely that the wall of the chest and the surface of the lung once receded from contact of each other become stiff and rigid so they cannot come together again. The surgeons have tried in these cases to make the chest wall movable or make the lung movable. Hence the Estlander Schede operation and a score of modifications of the same also the operation of pneumolysis is one which has been tried with good success at times and at times with poor result. Another very ingenious way has been suggested by Tuffier namely to implant large pieces of fat taken from a patient into such cavities after the costal pleura has been separated. I have tried to imitate this method by using in this particular case the breast gland which was quite large to fill out that cavity but without success.

The second cause of these chronic suppurations is an essential disease. There are individuals who have such cavities as the results of tuberculosis. The cavity is never free from tubercular deposits and hence unless these deposits are cured the tubercular process does not allow closure.

The third and probably the most common cause is the opening of this cavity into a bronchus a so called bronchial fistula which makes this cavity of the chest communicate through the



Fig. 55—Appearance of chest at present writing. Healing well advanced





bronchus with the outside, so that there are present two openings—one into the lung and one toward the outside. A combination of bronchial fistula and tuberculosis is also very frequent. Nature tries to accomplish the diminution of the cavity in many ways. The diaphragm is pulled up, as we can see distinctly in  $x$  ray examinations (see Fig 54), the spinal column curves toward the affected side, with the effect of diminishing the size of the cavity, the chest wall sinks in and the ribs take on a more angular shape instead of a curved shape, also diminishing the size. All these natural supports of the healing process have been increased by the surgeons when they tried to obliterate such cavities.

The diagnosis of such cavities is, in our times, comparatively easy. The  $x$  ray, with or without bismuth injection, solves this question absolutely. We can at once find out how large the cavity is and how it is shaped by stereoscopic pictures, and we can also find out whether a communication exists between this cavity and the bronchus. When we inject bismuth paste in these cases in most instances the patients cough up the bismuth just as soon as we inject it. When this happened in the first few cases, and the patients became cyanotic and had some spastic cough attacks after the injection, we were somewhat alarmed, but this does not worry us now because we have found that the injection is not only harmless, but often clears away lots of pus and mucus.

The conditions are not always as simple as indicated in the preceding pathologic outline. For instance, a spinal abscess which has broken into the chest cavity and produced an empyema without any affection of the lung but with the deviation of the spine, due to the bone process in the same, will be a very interesting study. If there are fistulæ leading to the skin from the spine and if they are injected, it may often happen that the paste runs out through the chest opening when the spine is injected, or vice versa. We have even seen paste injected into the spine come out through the lung in the presence of an associated bronchial fistula.

Recognizing the occurrence of unusual conditions such as the preceding, I would say that the majority of old empyema

cavities are of a plain character and the closure of the cavity is not possible purely on account of the mechanical impossibility of approximation of the two surfaces the chest and the lung

When treating these cavities we have tried to make the lung movable through suction. Getting the air out of that cavity was not hard but we have often seen hemorrhages follow such suction. Those granulations in the chest when sucked upon by this method are apt to bleed profusely and such bleeding is hard to stop. I recall a case of a young boy in whom we had such profuse hemorrhages that we were quite alarmed. They filled the chest cavity with blood and we stopped the hemorrhage by plugging up the hole in the chest wall until the pressure within became equal to the pressure of the blood stream and coagulation took place. Then the boy began to develop high fever. The blood clot became highly infected and caused very disagreeable symptoms.

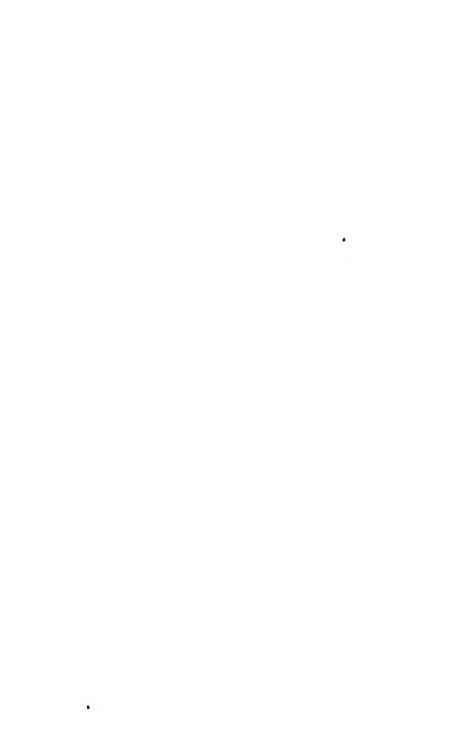
If we can close the opening in the bronchus we often can get the cavity to close spontaneously and therefore in the bronchial fistula cases most of our efforts are directed to the closure of the bronchus. We cauterize the opening in the bronchus with the actual cautery this has occasionally diminished the size of the opening. In the presence of two or three bronchial openings the cauterization has been done on all. The smoke from the cauterization is very unpleasant for the patient and makes him cough a good deal and often disturbs the healing. Nevertheless we have sometimes produced quite an improvement. I do not recall any case where we could close the fistula entirely by this method. In a large number of cases it has been impossible to get the fistula into the speculum and so within reach of the cautery.

Schede and Estlander operations I have done many times and I may say I have cured a number of empyema cases in this way, but none of them were characterized by what I would call extremely large cavities perhaps one-third or two fifths of the chest cavity being free from lung. When the lung has retracted to a very small shriveled up flap lying over the spinal column or retracted into the angle of the apex toward the large bronchi

then the question "how to close this cavity" becomes very pertinent.

My brother, Dr. Emil Beck, has for some time tried to close bronchial fistulæ by cutting out a flap from the skin of the chest wall and pushing it into the chest cavity toward the bronchus. In this way he forms a funnel with its apex in the bronchus. This method he has described and shown, and is now writing a special paper on that subject.

I have conceived the idea which you see has been carried out in this patient. Of course, if we remove the whole chest wall, including all the ribs, we deprive the trunk of much support on that side, and the immediate result will be much distortion toward the other side, with difficulty in breathing and interference with heart action. Therefore it is best to leave a portion of the chest wall posteriorly in the shape of a plate of ribs which fall closely together and support the back. They often fall upon each other like the shingles of a roof, covering each other to a certain extent and in that way making a solid wall. The flaps cut from the anterior portion of the chest are folded in, as you see, and gradually grow toward each other in such a manner as to line the cavity with skin and so effect complete healing.



# CLINIC OF DR. ALLEN B KANAVEL

WESLEY HOSPITAL

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## TRANSPLANTATION OF FASCIA LATA IN EXSTROPHY OF THE BLADDER, COMPLETE DEFECTS IN THE ABDOMINAL WALL, AND SPINA BIFIDA

**Summary** Wide usefulness of the transplantation of fascia lata, autoplasic transplants the best, necessity of determining compatibility of tissues before making transplants from donors other than the patient himself—agglutination test probably sufficient, an aseptic, vascular field desirable site for transplant, fate of fascial transplants

**Case I** Exstrophy of bladder with double inguinal hernia, the Second operation, value of fascial transplant, results, comparison of this treatment with other methods

**Case II** Complete defect of abdominal wall, huge postoperative hernia in a woman thirty five years of age, method of repair with fascia types of defects of the abdominal wall in which it is desirable

**Case III** Spina bifida, two questions to be considered in the treatment, technic of operation when to operate, prognosis

*November 6, 1916*

THESE cases are presented with the idea of emphasizing the value of fascia lata in repairing defects which would otherwise not be amenable to plastic procedures. They are chosen because they illustrate some of the rarer forms in which this method of cure is of avail. The commoner pathologic conditions in which transplantation of the fascia lata is done are well known to the profession, such as repair of the ordinary herniæ and cranial defects, tubulization of nerves, etc. That it has a wider application than this no one can doubt who has had experience in surgical work. I have transplanted fascia in more than 60 cases with marked success, as will be mentioned later.

In the use of fascia it is probable that autoplasic transplantation is superior to fascia taken from other individuals, and this can be done in almost all cases, although I have used the latter in several patients. When this is done it is advisable, it

seems to me, to test the hemolytic action of the blood or at least its agglutinating properties, with the idea of choosing those individuals in whom the hemolysis or cytotoxicity would not be probable. I believe that the agglutination test, which is more easily and quickly done, is just as satisfactory as the hemolytic test.

It would seem advisable to transplant fascia into areas in which there is a fair blood supply. It is remarkable with how little blood supply fascia lata will live, but on the other hand a fair blood supply surely increases the probability of success. I have also attempted in all cases to see that there is a free blood supply on both sides of the fascia lata flap and have never transplanted two layers in juxtaposition. It is also undeniable that an aseptic field offers the best hope of success. On the other hand, it has happened to all of us to transplant flaps into a septic field or to have the wound become infected without loss of the fascia lata transplant. It would seem reasonable, however, to attribute this to good fortune, and while I would not hesitate in case of necessity to do such a transplantation, I would expect success in not more than half the cases.

As to the fate of these transplants, we do not have a definite knowledge. From clinical evidence they grow in place and remain permanently as a part of the tissues. We do not have experimental evidence, however, to support this assumption and it is entirely possible that the fascia transplants are replaced by scar tissue. But if this be so, the resulting tissue must differ from ordinary scar tissue since we have clinical evidence that it does not stretch and lose its vitality as does such tissue. It is probable that fascia placed in such positions where the tissue is under strain, as in the muscular tissue or abdominal wall, will retain its function better than when transplanted into protected areas such as the dura.

The fascia is best procured from the fascia lata. It can be removed here without interfering with the function of the leg, and after it is removed the edges of the defect thus produced are drawn as closely together as possible by catgut sutures and the remaining area allowed to scar over underneath the closed skin.

When transplanted into the tissues care must be taken to tack down the edges and corners, since, if not so treated, the flaps have a tendency to roll up and become displaced

# CASE I—EXSTROPHY OF BLADDER WITH DOUBLE INGUINAL HERNIA

The first case here presented, that of Mr J M , Wesley Hospital No 45,113, entered the hospital January 9, 1914 He was



Fig 56 —Photograph of exstrophy of bladder before operation

twenty six years of age He presented the typical appearance of an exstrophy of the bladder and an epispadiac penis (Fig 56) The bladder wall exposed measured  $3\frac{1}{2}$  inches in width by  $2\frac{1}{2}$  inches in height corresponding to the defect in the abdominal



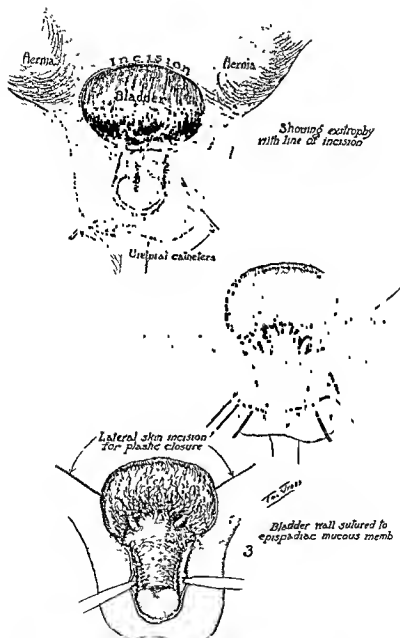


Fig 57

Figs 57, 58 — Drawings showing steps of modified Second operation as described in the text

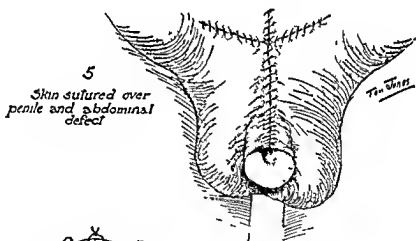
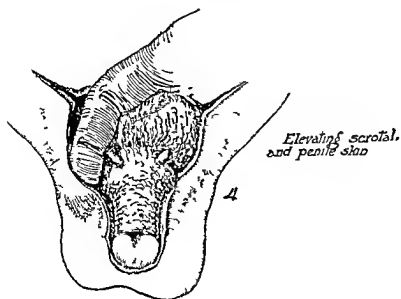


Diagram of cross section of penis showing new urethra and points of suture

wall. He also had a separation of the symphysis pubis of 8 cm and a double inguinal hernia. Catheterization of the exposed ureters showed there was apparently no pyelonephritis. The general physical examination is omitted since it was negative.

This case in brief presents the typical picture seen in all exstrophies of the bladder. The congenital defect of the symphysis is a necessary adjunct of the exstrophy and the double inguinal hernia is also a practically constant accompaniment of the condition.

He was operated upon in two stages. At the first operation the exstrophy of the bladder was cured and at the second operation the double inguinal herniæ were repaired. The method of operation chosen was a modification of the Second operation to which was added the transplantation of a flap of fascia lata to cover the defect in the abdominal wall and the repair of the herniæ at a subsequent operation. The operation was performed as follows:

Ureteral catheters were placed in the ureters to identify them and the bladder wall with its mucous membrane and musculature was separated from the skin throughout its circumference and with a sponge the peritoneum was pushed off the posterior surface of the bladder down to the ureters (Fig. 57 and 58). These were then freed for a distance of 1 inch from the base of the bladder care being taken not to remove the tissue immediately adjacent to the ureters so as not to injure their blood supply or their lymphatic connection. The lateral edge of the bladder as shown in the sketch (Fig. 57-2) was then excised. Incisions connecting the lateral incisions between the bladder and skin were then continued down the lateral dorsal surface of the epispadiac penis and the mucous membrane slightly raised. To this the mucous membrane on either side was sutured by interrupted catgut sutures the cut lateral edges of the bladder allowing the base of the bladder to remain back of the penis (Fig. 57-3). The skin of the scrotum and the abdominal wall was then dissected up including the excessive skin of the prepuce as shown in the sketch and drawn over the dorsum of the penis being sutured down the median line (Figs. 57 and 58). Two lateral incisions on

the abdomen from the cut edge of the defect in the skin, served to allow a more easy apposition of the skin over the lower portion of the abdomen and permitted a complete covering of the defect.

This operative procedure was followed by satisfactory results as far as the exstrophy of the bladder was concerned. At the removal of the stitches it was noted that the skin separated



Fig. 59—Photograph of patient three months after cure of exstrophy

$\frac{1}{4}$  inch for a distance of  $\frac{1}{2}$  inch on the dorsum of the penis. The remainder of the wound healed perfectly. This was rapidly covered by epithelium and the patient was discharged twenty-five days after the operation with the wound entirely healed (Fig. 59).

He returned to the hospital for the second operation in three

wall. He also had a separation of the symphysis pubis of 8 cm and a double inguinal hernia. Catheterization of the exposed ureters showed there was apparently no pyelonephritis. The general physical examination is omitted since it was negative.

This case in brief presents the typical picture seen in all exstrophes of the bladder. The congenital defect of the symphysis is a necessary adjunct of the exstrophy and the double inguinal hernia is also a practically constant accompaniment of the condition.

He was operated upon in two stages. At the first operation the exstrophy of the bladder was cured and at the second operation the double inguinal herniæ were repaired. The method of operation chosen was a modification of the Second operation to which was added the transplantation of a flap of fascia lata to cover the defect in the abdominal wall and the repair of the herniæ at a subsequent operation. The operation was performed as follows:

Ureteral catheters were placed in the ureters to identify them and the bladder wall with its mucous membrane and musculature was separated from the skin throughout its circumference and with a sponge the peritoneum was pushed off the posterior surface of the bladder down to the ureters (Figs 57 and 58). These were then freed for a distance of 1 inch from the base of the bladder care being taken not to remove the tissue immediately adjacent to the ureters so as not to injure their blood supply or their lymphatic connection. The lateral edge of the bladder as shown in the sketch (Fig 57 2) was then excised. Incisions connecting the lateral incisions between the bladder and skin were then continued down the lateral dorsal surface of the epispadiac penis and the mucous membrane slightly raised. To thus the mucous membrane on either side was sutured by interrupted catgut sutures the cut lateral edges of the bladder allowing the base of the bladder to remain back of the penis (Fig 57 3). The skin of the scrotum and the abdominal wall was then dissected up including the excessive skin of the prepuce as shown in

and we were very fearful that the flap would be lost. The infection gradually subsided and the temperature was normal at the end of one week. The wound healed, and the patient left the hospital at the end of five weeks with the wound entirely healed and no evidence of difficulty.



Fig. 60.—The transplantation of the bladder as shown in Figs. 57 and 58 leaves a large defect closed merely by peritoneum and skin. In addition to this defect there is a bilateral inguinal hernia demanding attention. In this figure the inguinal canal on each side has been exposed, the cord elevated, and we see that the border of the internal oblique muscle has been stitched to the shelf of Poupart's ligament. A strip of fascia (labeled *F*) has been stitched to Poupart's by one end and the other end has been carried beneath the external oblique aponeurosis across the defect, passing between skin and peritoneum and beneath the external oblique of the opposite side to be stitched to the corresponding ligament of Poupart, thus restoring to some extent the integrity of the abdominal wall.

The patient was examined again in July, 1916, one and one half years after the first operation, and it was found that the hernias had not returned, that there was no excessive bulging through the old defect in the abdominal wall. The patient when lying upon his back in bed could hold his urine during the entire night. When in an upright position, however, there was incontinence, with this exception, that for one half to one hour after

The wound healed without infection, and at the end of eight months the patient reported for examination, at which time the hernia had not returned, as will be seen by examining Figs 61 and 62

This case is reported because of the interest attached to the use of *fascia lata transplant* to cover in such a defect. We have used it many times in all types of hernias particularly in ventral hernia and in that type of *inguinal hernia* in which we have difficulty in closing the posterior wall of the canal. Here it is needed



Fig 61

Fig 62

Figs 61, 62—Anterior and lateral views eight months after operation. Vertical scar is of the old operation and transverse scar of later operation.

in two types of cases: first in patients who are excessively obese, second in those in whom the conjoint tendon does not attach itself to the pubic spine—a congenital anomaly that is not infrequently seen in spite of its absence from the literature. Attention has been drawn to this defect by Dr Hessert, whose valuable report discloses that it is much more frequent than one would suppose. Here, owing to the impossibility of bringing the conjoint tendon to Poupart's ligament, the defect will persist unless some transplantation of tissue is carried out. Here the fascia lata transplant is inserted from Poupart's ligament underneath

the rectus abdominis to the opposite side where it is sutured in position to Poupart's ligament and the cord laid over it

### CASE III—SPINA BIFIDA

The treatment of spina bifida concerns itself with two questions first, as to the closure of the spinal defect, second, as to the ultimate consequence of such a closure

#### HISTORY

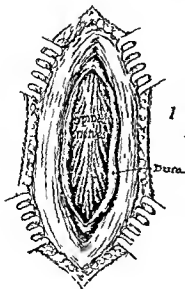
M F age ten days Wesley Hospital, No 62,586 The child presented a defect of the lower lumbar region involving three vertebræ The sac was  $1\frac{1}{2}$  inches in diameter, clear and glistening in its central portion with fine capillaries around the edge of the sac It was so thin that a rupture was imminent There was some lack of function in the legs

#### OPERATION

At operation it was found that the nerves ran through the walls of the sac as well as within the canal These were carefully dissected off and restored to their position in the canal, the excessive sac removed, and the dura sutured over it, the child meanwhile being placed with his head downward A lateral incision was made in the muscles at each side of the defect and thus allowed the muscularis and aponeurosis of the adjacent region to be sutured over the dura This was reinforced by a flap of fascia lata taken from the mother's leg the agglutination test having shown a lack of hemolysis This was tacked down by sutures as shown in the drawing (Fig 63) The skin was closed over this fascia lata and a photograph taken at the end of two weeks herewith presented shows a complete cure (Fig 64)

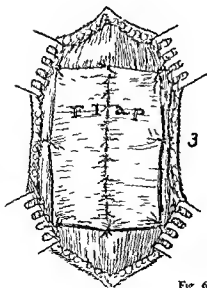
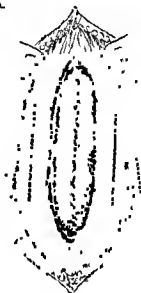
Examination discloses at the present time three weeks after the operation no evidence of return of pressure and no evidence of a beginning hydrocephalus although it is too early at the present time to say definitely whether or not this will ensue The mother states that the action of the legs is much more free than it was previous to the operation and examination fails to disclose any lack of motion in the legs The child has bladder control





1 Nerves dissected free from dural sac and replaced into canal

Dura closed and later incisions made preparatory to bringing muscle together over cord



3 Fascia lata flap sutured over line of closure of canal

Fig 63

in that there is no dribbling of urine or overdistention of the bladder.

The question arises when to operate on these cases. In the majority of cases it will be found advisable to operate shortly after birth. In my experience an operation within ten days to two weeks after birth is not of great danger. The child is operated upon quickly, with the head downward and the back elevated; no attempt is made at extensive plastic procedures, and the results are very satisfactory. Unfortunately, one cannot say as



Fig. 64 —Photograph of child ten days after operation.

to the ultimate outcome in regard to hydrocephalus, since a certain percentage of these cases will present this complication later, thus emphasizing the question as to the etiology of spina bifida, whether due to a congenital defect of the vertebral region or due to excessive pressure within the spinal canal incident to perverted physiology of the choroid plexus or other cells.

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Fig. 63 —Steps in technic of closure of spinal defect and transplantation of fascia. Note in 3 the precision with which the corners and edges of the flap are sewed in place in order to insure against its rolling up or being displaced. The line of closure of the muscles is shown through the fascial flap.



## CLINIC OF DR. D. N. EISENDRATH

### COOK COUNTY HOSPITAL

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#### HEAD INJURIES—TWO CASES COMPLICATED BY SYMPTOMS OF INTRACRANIAL INVOLVEMENT

*Summary.* Necessary steps in routine examination, signs and symptoms of fractured skull, differential diagnosis, treatment, and prognosis of cerebral concussion, cerebral laceration (contusion), and cerebral compression, great value of lumbar puncture in the diagnosis of intracranial injury

*October 20, 1916.*

HERE are two cases illustrating different forms of injuries to the head. The most important question which arises in connection with such patients is the extent of damage to the various structures which lie within the skull. A few hours' delay in recognizing the presence of hemorrhage from the middle meningeal artery may cost a life which could have been saved by an early diagnosis.

It is our custom in this hospital to disinfect a scalp wound as thoroughly as possible and to examine the underlying vertex of the skull for depressed and non-depressed fractures in every case. A serious injury to the brain and other intracranial structures may, of course, take place without much visible external evidence in the shape of contusions or wounds of the scalp, but this is rather the exception than the rule.

The routine examination of a case of head injury should include the following:

- 1 Examination of the vertex for evidences of fracture
- 2 Lumbar puncture
- 3 Radiography (preferably stereoscopic) of the skull
4. Search for the special signs of fractures of the base (see p

170)

5 Determination of whether symptoms of (a) concussion or, later, of acute spreading edema, (b) contusion or (c) compression of the brain are present

6 Search for evidences of infection in cases after thirty six to forty eight hours

Fractures of the skull are usually divided into those of the vertex (above Reid's base line) and those of the base (below Reid's base line). The statistics of Brun show that 75 per cent of the fractures of the vertex extend into the base, the middle fossa of the latter being most often involved. There is no longer any sharp line between fractures of the vertex and base because both may be complicated by the same form of intracranial injury. In the past we have been too apt to overlook the evidence of brain injury and to search only for the special signs of fracture. Today we are learning to study our cases from the standpoint of intracranial rather than bone injuries.

The signs of fracture of the base vary according to the fossa which the line of fracture traverses. They are as follows:

I In fractures through anterior fossa (1) Hemorrhage into eyelids and conjunctivæ (2) Bleeding or escape of cerebrospinal fluid or (rarely) brain tissue from the nose or mouth (3) Loss of sense of smell (a late symptom)

II Fractures through middle fossa (most frequent location) (1) Escape of blood or cerebrospinal fluid from the ears rarely of brain tissue (2) Signs of injury to cranial nerves (second to seventh)

III Fractures through posterior fossa (1) Escape of blood from the ear (2) Subcutaneous ecchymoses on back of neck (3) Evidence of injury of seventh to twelfth cranial nerves

One cannot say that the bleeding from the ears is due to a fracture through the petrous portion of the temporal bone until the ear and external auditory canal have been excluded as possible sources of the bleeding. The external ear having been cleansed and examined I always cover it in cases of fracture with a collodion gauze dressing to prevent infection.

The diagnosis of a fracture of the base is made by combining the results obtained by the search for the special signs just given

with the evidence of damage to the other intracranial structures; e g, the brain, meningeal vessels, sinuses, and the internal carotid artery.

The diagnosis of a fracture of the vertex is easier in many respects. In addition to the inspection of the skull through the retracted edges of the scalp wound we may have the same evidences of intracranial damage as in fractures of the base. Never rely upon the fact that the patient is brought to you with one or more scalp wounds carefully sutured to lead you to exclude the presence of a skull fracture. The responsibility is yours, and no explanations will be accepted if a depressed fracture has been overlooked or the symptoms of intracranial sepsis due to an infected fissured or depressed fracture appear in a few days after you have accepted the opinion of the "first aid" surgeon that there was no injury to the skull, and hence have failed to examine the sutured scalp wounds.

The following table will be of aid in the determination of which form of damage to the brain is present:

	<i>Concussion</i>	<i>Laceration (Contusion)</i>	<i>Compression</i>
1 Time of onset of symptoms	Immediately after accident	Immediate, but symptoms at first may be obscured by those of concussion or compression	Three clinical pictures: e g. (a) no symptoms, then coma, (b) concussion or contusion signs then lucid interval followed by coma, (c) no lucid interval between concussion and compression symptoms
2 General cerebral symptoms	Complete loss of consciousness for some minutes to hours. Vomiting in milder cases	Delirious unless complicated by concussion or compression. In acute spreading edema the delirium and restlessness follow as soon as concussion signs disappear or lessen	Restlessness and apathy at first gradually changing to deep coma in hemorrhage. Immediate compression signs in majority of depressed fractures
3 Focal symptoms	None unless complicated by contusion or compression or injury to cranial nerves in fractures of base	Localized or general twitchings and convulsions accompanied by pareses or paralyses. May have aphasia if third left frontal convolution is involved	Localized (face or arm or leg) twitchings and convulsions precede paralysis (usually in form of mono- or hemiplegia). Convulsions less frequent in hemorrhage than in contusion
4 Pulse	Varies—either increased and irregular, or slow and full.	No change unless medulla is affected then indistinguishable from paralytic stage of concussion and compression except by early onset of rapid feeble pulse	Slow (40-60) and of high tension at first later becomes rapid and irregular as soon as medulla is involved.

	<i>Concussion</i>	<i>Laceration (Contusion)</i>	<i>Compression</i>
5 Respiration	Slow, shallow and sighing	Same as above true for respiration	Slower and labored (stertorous) May be irregular or of Cheyne Stokes type in later stages
6 Blood-pressure	Slight rise	No change	Gradual rise as intra cranial tension increases
7 Pupils and eye balls	Equal and contracted in mild cases Dilated in severe cases	No change unless occipital lobe is involved (homonymous hemianopsia)	Pupils usually unequal and react differently to light Dilated on a side of injury
8 Temperature	Subnormal	Quite high early and of continuous type One of most important evidences of contusion	Usually rises as pressure increases but not as high as in contusion.
9 Lumbar puncture	Negative	Blood in spinal fluid under tension	Blood only if intermeningeal hemorrhage & & into subdural space
10 Course	(a) Symptoms gradually decrease (stage of reaction) and recovery or (b) signs of cerebral irritation appear (due to cerebral contusion)	Signs of localized injury gradually disappear Very few become permanent.	Coma, etc increase and paralytic stage sets in unless relieved

Let us see under which of the divisions these patients belong

#### CASE I

Examination of this patient upon admission to the hospital four days ago showed a man in coma with a long scalp wound over the right parietal region and extensive hemorrhage beneath the pericranium, but no visible fracture of the skull. Pulse was 94, full and bounding, the temperature was normal and the respirations 30 and shallow. There was involuntary urination and defecation. The pupils were unequal but reacted to light. Lateral nystagmus was quite marked. Both eyelids were swollen, but there was no bleeding from nose or ears nor were there occipital ecchymoses. The blood pressure was 150 mm. A lumbar puncture allowed the escape of bloody fluid under tension. At our examination today the man is conscious and intelligently responds to questions but rather slowly. The pulse rate is 60 and the temperature is normal. He has regained control of the sphincters, but is still very restless, constantly pulling at his bed clothing and throwing himself about. There are no focal symptoms of a cortical lesion. A stereoscopic radiograph has not disclosed a fracture.

Glancing at our table, we find that this man's initial symptoms were those of concussion. The presence of a bloody fluid under tension obtained by lumbar puncture shows that there was intermeningeal hemorrhage or cerebral contusion present in addition to the concussion. The signs of concussion are now being replaced by those of cerebral edema or irritation, as suggested principally by the patient's restlessness. The absence of delirium, the normal temperature, and the absence of signs of localized injury indicate that the degree of contusion, the presence of which is strongly suggested by the bloody cerebrospinal fluid and the restlessness, is slight. There is no evidence of compression. We, therefore, make the diagnosis of moderately severe cerebral concussion with evidences of mild contusion.

This patient has been treated by the sovereign remedy in all cases of brain injury, unless signs of compression appear, that is, absolute rest. If necessary, morphin and bromids may be used freely in order to gain this end. No matter how mild a case of concussion may appear to be, it should be carefully watched for signs of incipient compression due to rupture of the middle meningeal artery with extradural hemorrhage or to a subdural clot from a wound of the venous sinuses or extensive injury of the vessels of the pia arachnoid. The symptoms of compression due to subdural hemorrhage appear after a longer free interval, are much slower in developing and not as well localized as those due to an extradural clot. It is well to remember, however, that if the dura is torn hemorrhage from the middle meningeal may be both outside of and beneath the dura. I am not in favor of subtemporal decompression for cases of severe concussion or even of cerebral contusion, but believe that repeated lumbar punctures are equally as safe and afford more relief. One must remember that hemorrhage from the middle meningeal artery may appear several weeks after a head injury, and hence a severe case of cerebral concussion should be kept in bed and under observation for at least four weeks.

I believe that the position taken by Frazier<sup>1</sup> in regard to the indications for decompression in these head injuries is a most

<sup>1</sup> *Progressive Medicine* March 1916



rational one. He divides the cases of concussion with associated contusion (rapidly increasing intracranial tension and rapidly diffusing edema) into (1) Injury slight. Best to leave alone. (2) Damage great as shown by rising temperature—these die in a short time. (3) Serious cases but life not threatened (slow full pulse, coma, and irregular breathing; *i. e.*, signs of medullary pressure), the maximum intensity of the clinical picture is reached in twenty four to forty eight hours, then there is gradual restoration of consciousness and subsidence of signs of pressure. (4) After first shock, symptoms of intracranial tension increase and signs of incipient respiratory and cardiac break down appear. Groups 1 and 2 require no treatment. There is no benefit from decompression in Group 3 and it is only imperative in Group 4. You can readily distinguish cases of cerebral contusion from those of increased intracranial tension due to an extradural or subdural clot by the absence of focal signs of irritation and paralysis. A rise of temperature is pathognomonic of cerebral contusion and appears early. Fever appearing forty eight to seventy two hours after a head injury is usually due to infection or to some intracranial cause and not to contusion.

## CASE II

This patient, a man of sixty, was brought to the hospital in a deeply comatose condition September 27, 1916. There were no scalp wounds or evidences of fracture of the vertex or base. Lumbar puncture showed a bloody fluid escaping under tension. No history as to the mode of injury could be obtained. There was no rise in temperature and the pulse, respiration, and blood pressure did not indicate any increased intracranial tension. The case was diagnosed as one of severe concussion and moderately severe contusion. There was a gradual return of consciousness within three days after admission.

Convulsions or twitchings were not observed during these first three days but after the symptoms of concussion had receded the value of our obtaining a bloody fluid under tension by lumbar puncture as an aid in the diagnosis of contusion and of intermeningeal hemorrhage was shown by the fact that the patient could

not move the right arm and leg and could not speak. The radiograph of the skull was negative. We find today that when we show him a watch set at 3 o'clock and ask him whether it is 4 o'clock he indicates a negative answer by shaking his head, but he cannot speak. This shows that he has a motor aphasia, but no sensory aphasia. He seems quite intelligent and readily protrudes his tongue or lifts his left arm or leg. When the clouds of cerebral concussion disappeared from his mental sky and only the focal signs due to the cerebral contusion were left as evidences of his brain injury, the motor aphasia and spastic paralysis of the right arm and leg became noticeable. We have in this patient an example of how guarded our prognosis should be in every case of severe concussion or contusion of the brain. The damage to important cortical centers was completely obscured by the symptoms of concussion, and it was only when the angry waves (to use a simile) due to the oscillation of the tissues of the brain subsided that the extent of the wreckage in the shape of temporary destruction of the speech, arm, and leg centers could be seen. I say "temporary," because in the majority of cases the contused cerebral tissue is gradually replaced and the evidences of focal lesions like those in our patient slowly subside.

In every case of unconsciousness without a history one must differentiate coma due to brain injury from the following: Coma due to cerebral hemorrhage or to pachymeningitis hæmorrhagica (the latter a very frequent condition in alcoholics), uremic coma, diabetic coma, alcoholic coma, opium-poisoning, hysteric coma, and syphilitic or other forms of meningitis of non-traumatic origin. If one has excluded all of the above causes of coma, it is safe to say that the case is one of concussion due to injury, and the pulse, temperature, respiration, and blood-pressure must be noted at frequent intervals in order to make a diagnosis of cerebral compression due to hemorrhage should it appear, at the earliest possible moment. In many cases the symptoms of concussion may clear up and a lucid interval of hours to days intervene before the signs of compression appear. In other cases the free or lucid interval is so short as to be overlooked or entirely lacking. It is in this latter class that we so often miss the golden moment

when surgical intervention would be of avail. The average duration of life in non operated cases of middle meningeal hemorrhage is twenty five hours. It follows that *eternal vigilance must be our watchword in head injuries*.

In this patient with evidences of such severe injury to the brain tissue in the left precentral and third frontal convolutions we must be very guarded in our prognosis. Restoration to function will be very slow and months of careful after treatment will be required. The possibility of an abscess of the brain months to years later must not be forgotten. I have seen a case of cerebral abscess twelve years after a compound fracture of the frontal bone with severe contusion of the frontal lobe.

Let me emphasize the value of lumbar puncture in the diagnosis of intracranial injury and again urge you to be very conservative in the treatment of these cases unless evidences of compression due to hemorrhage appear, then operation should be performed at as early a period as possible. I will discuss the special subject of gunshot injuries in a later lecture.

## CARCINOMATOUS ULCER ON POSTERIOR WALL OF STOMACH WITH PERFORATION INTO LESSER PERITONEAL CAVITY; WITH A TALK ON THE REHFUSS FRACTIONAL ASPIRATION METHOD BY DR. WALTER W. HAMBURGER

*Summary* Signs and symptoms of carcinoma of the stomach, advantages of Rehfuß fractional aspiration method of testing gastric secretions over Ewald method, necessity of taking roentgenograms in lateral as well as in antero-posterior position in gastric cases, when to operate, exploratory gastrotomy

*October 13, 1916.*

I DESIRE to present to you a patient who comes to the hospital complaining of "stomach trouble." His principal symptoms are

1. Pain in the umbilical region, constantly present but more severe at times. The pain bears no relation to the ingestion of food and is rather sharp in character.

2. Loss of appetite and weight and an increasing inability to do his ordinary work.

3. A feeling of oppression and, as he expresses it, of "gas on the stomach."

The family history is negative. He drinks moderately. Examination of the heart and lungs yields negative results. The blood examination shows 4,590,000 red corpuscles, 89 per cent hemoglobin, and 18,900 white cells. His nutrition is poor, the subcuticular fat being greatly decreased. There are no visible evidences of jaundice in the sclera or on the roof of the mouth, two locations where one can see evidence of icterus long before it appears on the skin. The abdomen is soft, retracted and there is no visible peristalsis or tumor, although even on light pressure there is distinct tenderness in the epigastric region. Analysis of the gastric contents after an Ewald test-meal shows an absence of free hydrochloric acid and a marked decrease in the total acidity. Examination of both the stomach contents and of the feces shows the presence of blood. The roentgenographic ex-

amination shows evidences of retention and a marked irregularity (filling defect) along the lesser curvature near the cardia (Fig 65)

The Ewald test meal is being supplanted by a newer method known as the Rehfuess fractional aspiration method. I shall ask my colleague Dr Walter W Hamburger to explain it.

DR HAMBURGER. A piece of No 8 or 9 rubber tubing with a heavy metal tip, having a number of slit like openings is



L.

T.E.

Fig 65 —Filling defect on lesser curvature in a case of perforation of a carcinomatous ulcer of the posterior wall of the stomach

swallowed by the patient. This tube remains in the stomach for three hours during which time the contents are aspirated every thirty minutes. Rehfuess described the method in 1912 though the idea of passing a small tube and allowing it to remain in the stomach was suggested by Schule in 1895. The disadvantage of the ordinary Ewald meal is that you obtain only one reading after the test the aspiration showing the condition of the gastric con-

tents forty-five or sixty minutes after the meal. It may be quite unreliable if the stomach functions are slow or variable. Rehfuß evolved a plan of frequent aspirations starting thirty minutes after a meal was given and continuing to aspirate at intervals of half an hour for three hours, thus getting an accurate picture of the whole cycle of gastric digestion.

We give 300 c. c. of tea containing lactose, and thirty minutes later the Rehfuß tube is passed and the first aspiration obtained. Then the other aspirations are made at intervals of

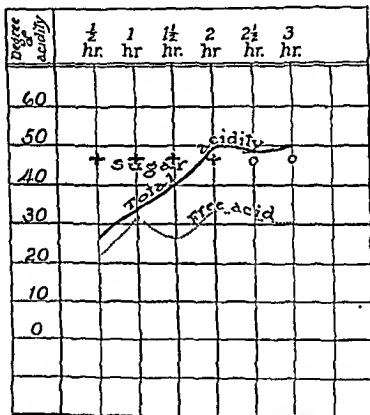


Fig. 66—Curve obtained by Rehfuß test in a case of carcinoma of stomach with hyperacidity (Dr. J. C. Friedman)

half an hour for three hours. A glance at the results obtained (Fig. 66) enables one to make a definite curve showing both the secretory and motor functions of the stomach.

In gastric carcinoma there is usually a diminution of both the free and total acidity, but there are many cases of benign diseases,

such as achylia gastrica in which the differentiation is very difficult because there is likewise a marked decrease in both free and combined acidity. Moreover there is a group of achylia where the clinical picture resembles very closely a carcinoma of the stomach. Rovsing has described cases of severe gastroparesis associated with an achylia which simulated carcinoma very closely. In such cases the Rehfuess test is very valuable because it permits one to make a curve showing the progress of secretion at intervals of fifteen to thirty minutes for two to three hours. During the past year (1916) two comprehensive studies of the fractional method have been published by Talbot<sup>1</sup> and Fishbaugh.<sup>2</sup> The conclusions of the latter as given below are of great interest.

1 One hour stomach examinations afford insufficient and often misleading information concerning the acidity and enzyme secretion. It gives no evidence of the secretory curve.

2 The fractional method of stomach examination follows the entire cycle of digestion and supplies reliable information concerning the type of secretory curve, the degree of acidity, the ferment content, and an accurate estimation of the emptying time.

As the Rehfuess test was not used in the present case it is of course impossible to tell you what the results of such an analysis would be, but I feel that it would follow closely that obtained by Dr. Friedman in a patient with a strikingly similar history and almost identical physical findings. As you see (Fig. 67) in contrast to the patient whose curve is shown in Fig. 66 there is a total absence of free acid throughout the test and the total acidity remains at a nearly constant and very low figure. Such a curve representing several hours of observation leaves little room to doubt that we are dealing with an actual anacidity, a complete loss of function by the acid secreting cells.

DR. EISENDRATH: I am sure we are very much indebted to Dr. Hamburger for his very interesting presentation of this subject.

<sup>1</sup>Jour. Amer. Med. Assoc. vol. LXVI, 1849, June 10, 1916.

<sup>2</sup>Jour. Amer. Med. Assoc. vol. LXVI, 1275, October 28, 1916. These articles review the literature and can be recommended to those who desire more detailed information in regard to the Rehfuess test.

Now to sum up, we have a history of a disturbance of gastric function in a man of sixty six with marked loss of weight and strength. These three symptoms—(a) history of "stomach trouble" (b) loss of weight, and (c) loss of strength—should always lead us to examine a man of his age for signs of malignancy. Have we such signs? The absence of free hydrochloric acid and a marked decrease in combined acid is often found in carcinoma of the

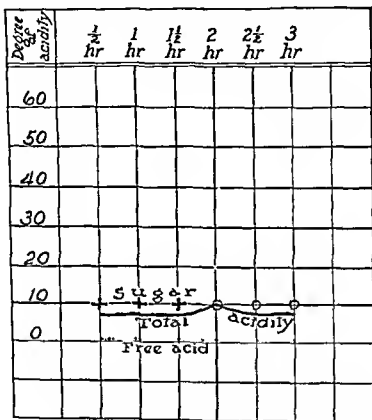


Fig 67—Curve obtained by Rehluss test in a case of carcinoma of stomach with an acidity and impaired motility (Dr J C Friedman)

stomach and although not pathognomonic of that disease, is very suggestive. Second, the large filling defect in the roentgenogram of the stomach, taken with the patient lying on his back, is indicative of a lesion in the stomach wall. Let me direct your attention to an omission in the method of x ray examination of this case, namely, there is no report of whether the fluoroscopic examination, and the plates taken following it, included a view of



the stomach in the lateral position so as to secure a view which would show an ulcer causing a bismuth or barium shadow in the posterior wall bulging into the lesser peritoneal cavity if it were present. Such a lesion is illustrated by Fig 68 taken from another case.

Third the presence of blood in the stomach contents and in the stool is confirmatory of the *x* ray findings telling us that the



Fig 68—Redra is roentogram (lateral view) showing diverticulum at A which proved to be a perforated ulcer of the posterior wall of the stomach

defect is in the stomach and not on the duodenal side of the pyloric ring and in addition that it presents a raw bleeding surface.

These considerations in conjunction with the age of the patient and the three points in his history which were mentioned earlier suggest to us the pre operative diagnosis of carcinoma on the lesser curvature of the stomach. We might add developing upon a chronic callous ulcer in order to emphasize the probable close relationship etiologically between carcinoma and ulcer.

but our failure to obtain a history of recurrent attacks of stomach trouble extending over a period of years hardly warrants the assumption.

Are we justified in performing an exploratory operation? Is our interference too late to be of much value? The ideal period for operative interference is not when a tumor can be felt, but rather when, with a suspicious history, we have x-ray evidences of tumor or of a calloused gastric ulcer. Some pathologists believe that 70 per cent. of such ulcers are already malignant, while others think that malignant changes are not found in more than 20 per cent. An explanatory operation is becoming more and more justifiable as the knowledge becomes more widely disseminated that the majority of chronic gastric ulcers are potential carcinomas. This being the case, we may feel not only that an exploratory operation is justified, but that it is demanded in this instance. How about the failure to palpate a mass in this man's abdomen? Never wait until a tumor can be felt. A cancer of the stomach which can be felt through the abdominal wall is usually past cure. In these cases it is better to operate on a justifiable suspicion than to await certainty. But we should operate even in the presence of a mass, first, because occasionally it may be susceptible of complete removal and, therefore, cure; and, second, occasionally such masses are only inflammatory and subside following the drainage afforded by the gastro-enterostomy. Therefore we will operate upon this man, being ready to follow the indications which our exploration may uncover.

### OPERATION

A median laparotomy incision reveals the absence of liver or peritoneal metastases. One must never overlook the fact that metastases of carcinoma of the stomach may appear in the rectovesical or rectovaginal fold at a comparatively early period and can often be felt through the rectum before operation. One should examine the stomach in a certain order—*e. g.*, pyloric region, anterior wall, greater curvature, lesser curvature, posterior wall, and, finally, the cardiac end of the stomach. We find no changes in this stomach until we reach the lesser curvature, which

appears irregular in outline, retracted, and fixed posteriorly by a hard mass which extends from the cardia almost to the pylorus. The mass involves the fat of the lesser omentum and the entire posterior wall of the stomach and the pancreas lying behind it. It feels more like an inflammatory induration, and the marked tenderness over the epigastrium and the leukocytosis (18 900) would

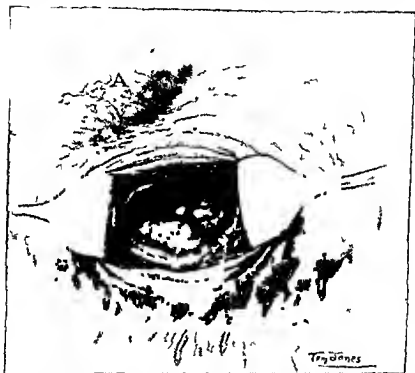


Fig 69—View through incision in anterior wall of stomach showing a large perforated ulcer of posterior wall with retroperitoneal tissues and pancreas forming floor of cavity. The edges of the ulcer were smooth with the exception of the lower left quadrant which showed typical carcinomatous change. A Inflamed tissue of lesser omentum forming upper wall of retroperitoneal abscess cavity. P pancreas

seem to confirm this view were it not for the fact that a number of very hard lymph nodes can be felt around the celiac axis (over the anterior surface of the spine). We know that quite a large proportion (52 per cent) of such enlarged nodes are of inflammatory nature, but these are much too hard for such a possibility and are undoubtedly of malignant nature.

Let us open the stomach by a vertical incision through the anterior wall, a method which I call exploratory gastrotomy, and have found of great value in determining by palpation within the stomach the presence of ulcer or carcinoma in doubtful cases. We now see that if we had made the fluoroscopic examination and taken the plates with the patient in the lateral position our diagnosis could have been made even more detailed than that

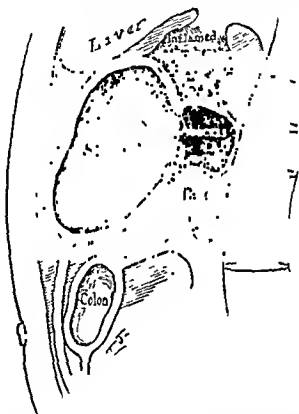


Fig 70—Diagrammatic sagittal section showing relations in case of perforating carcinomatous ulcer of posterior wall of stomach

of carcinoma of the lesser curvature. There is a defect in the posterior wall of the stomach about the size of the palm of the adult hand which represents an extensive perforation of a carcinomatous ulcer (Figs. 69 and 70) into the lesser peritoneal cavity. The edges of the defect are soft except along its lower border, where a typical carcinomatous edge presents.<sup>1</sup> The walls

<sup>1</sup>Microscopic examination confirmed the carcinomatous character of the edge

of the cavity are formed by the retroperitoneal tissues, especially the pancreas, and the floor of the cavity is covered by the debris of decomposing food particles. Radical operation is out of the question, so our exploratory gastrotomy will be sutured and the abdomen closed in the usual manner.

This case illustrates the adaptability and the technic of the Rehfuß method, the necessity of lateral views when roentgenographing stomach lesions, and the relatively few signs that may follow perforation of the posterior wall of the stomach. I also believe that it lends weight to my admonition to operate such cases on justifiable suspicion and never to let the absence of palpable intra-abdominal tumors outweigh the evidence furnished by the history, the laboratory findings, and the x-ray.

## CLINIC OF DR. KELLOGG SPEED

### COOK COUNTY HOSPITAL

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## TENDOPLASTY FOR WRIST-DROP; DESCRIPTION OF A NEW OPERATION

*Summary:* Indications for operation; technic; advantages over older methods; results.

This operation is intended to alleviate the deformity of wrist-drop in permanent lesions of the musculospiral nerve. An endeavor has been made to conform to anatomic and orthopedic principles in its technic and application. Besides the main indication under which this operation was devised, that is, severance of the nerve by gunshot injury, it can be used in any traumatic injury of the nerve in which it is proved that there is complete loss of neuron conduction requiring correction by suture, nerve plastic, or other operation. If the nerve destruction is irremediable, the operation offers a permanent cure of the deformity, not a complete restoration of function. If the nerve injury is amenable to treatment, but many months of waiting for neuron growth is expected, the tendoplasty promises to retain a balance in the forearm muscle groups and prevent some atrophy and contraction in the flexors, as well as stretching of the extensors pending the time of renewed active function of the muscles.

### TECHNIC

The accompanying illustrations demonstrate the procedure. Longitudinal incisions are made over the flexor carpi radialis and ulnaris tendon to expose them (Fig. 71). One-half of each tendon is cut from its wrist insertion, a longitudinal split is made up toward the muscle belly, giving a sufficient length of free tendon to pass across the back of the wrist by a tunnel through the superficial tissue (Fig. 71). The dorsum of the hand is opened by a small incision over the heads of the second and fifth metacarpal bones, the periosteum is incised and reflected, and the free ends

of the cut tendons are sutured to bare bone by a cutting needle with silk or kangaroo tendon while the hand is held in complete

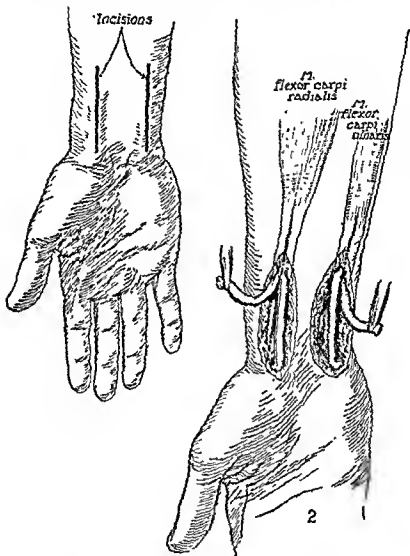


Fig 71

extension (Fig. 72, 4). A Jones metal extension hand splint is applied to hold the hand rigidly in hyperextension (Fig. 72, 5).

The insertion of the tendons into the bone gives a safe ortho-

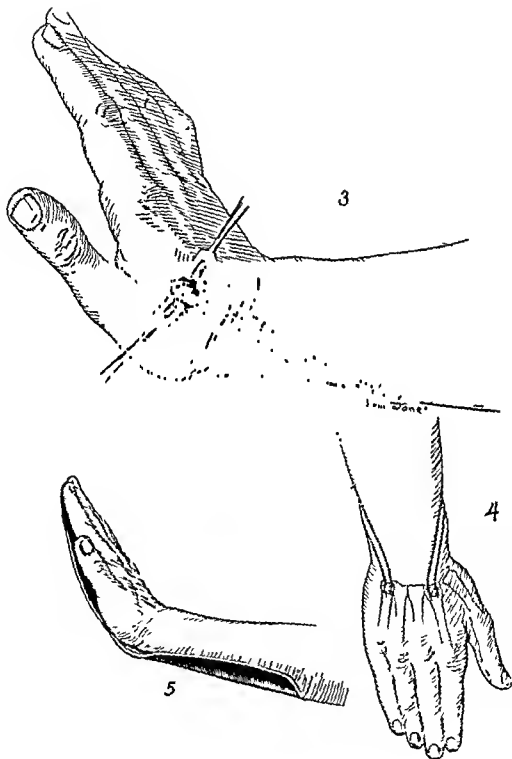


Fig 72



pedic anchorage. An anchorage into the extensor tendons is tedious, exposes larger areas to infection and is uncertain in result. The use of one half of each flexor tendon gives greater strength, *balances the hand* in extension or flexion and leaves one half of the tendon for its normal function. The use of all of either flexor tendon leads to a hand unbalanced toward the ulnar or radial side.

Hyperextension is maintained at least three weeks. After five weeks the hand assumes a position of balance and slight extensor power is possible. Grasp and flexion are uninterfered.



Fig. 73.—Case on whom tendon operation was performed for wrist drop. The picture was taken one week after musculospiral nerve was resected ( $\frac{3}{4}$  inch removed) and sutured. Note that he can and does hold hand in balance. He had 10 to 15 degrees of extension in the hand above the straight line.

with. In one case (Fig. 73) so operated on in spite of an infected wound in the arm a perfectly aseptic result was obtained and the patient had 10 to 12 degrees extensor power at the wrist in five weeks. A nerve suture had been performed three days before this picture was taken with the excision of  $\frac{3}{4}$  inch of the nerve trunk in the arm so that all motion depended on the new tendon insertion.

## CLINIC OF DR SAMUEL C PLUMMER

ST LUKE'S HOSPITAL

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### A CASE OF CALCULOUS ANURIA

*Summary* A patient who has had repeated attacks of bilateral lumbar pain associated with the passage of gravel and blood and several periods of complete anuria which were successfully treated by non surgical measures questions in diagnosis pyelotomy with removal of uric acid calculi which were not disclosed by the pre-operative x ray examination recovery

October 3, 1916

THE patient, J D, you will notice is a man of large frame He is fifty eight years of age, white, and a painter by occupation As to his personal habits, he smokes to excess and uses alcohol somewhat beyond the limits of moderation You see that he is well nourished and has thick abdominal walls

The patient states that about five years ago he had his first attack It began by dull constant pain in the left lumbar region, which lasted two or three hours After the pain subsided he noticed small gravel in his urine Six or eight months later he was taken with a similar attack which was somewhat more severe than the first Other attacks followed at shorter intervals and were a little more severe each time Three years ago he had quite a severe attack which was followed by blood in the urine and passage of several quite large stones and blood clots The attacks became still more frequent and the pain became quite sharp at the height of each attack, with a duration of eight to ten hours During this time neither change of position, hot applications nor anything else gave relief Each was followed by the passage of a considerable number of stones During the later attacks the pain was equal on both sides

In May, 1916, he had a very severe attack similar to the above, which was followed by complete suppression of urine for forty eight hours He was taken to a hospital and treated by

sweats and bleeding. He had pronounced symptoms of uremia during this attack, reaching even the stage of coma.

In September, 1916, he had another attack which resulted in anuria, which began on September 4th. I saw him first at his residence on September 7th with Dr. Neil M. Gunn. At this time his general condition was good, but in view of the history of the previous attacks, in which pronounced uremic symptoms developed, it was thought advisable to send him to St. Luke's Hospital.

On September 8th a cystoscopic examination was made by Dr. Arthur H. Curtis. The findings were as follows:

There was a slight erosion of the fundus and a moderate general congestion of the bladder. There was no urine in the bladder and the ureteral orifices were normal. Both ureters were catheterized to the kidneys and no urine obtained. The patient was given diuretin, and on the evening of September 8th was given  $\frac{1}{2}$  grain of pilocarpin hypodermically while in a hot-pack, during which diaphoresis was profuse. This was followed by an ampule of pituitrin, and within a few hours he passed 6 ounces of urine after almost five days of complete anuria. About thirty-six hours before he began to urinate the patient developed uremic symptoms and became quite irrational. After he once began to pass urine the flow continued to be free. The patient left the hospital on September 13th against my advice. His general condition was satisfactory, but I wished to make further examinations of him to determine if possible the cause of his anuria.

Six days later the patient entered the hospital a second time, giving a history of complete anuria of two days' standing. He was treated as before, but it was not until September 23d that he again urinated, after having again developed uremic symptoms. Thus he had had another period of six days with complete anuria. As in the instance of his first stay in the hospital, the urination continued quite free after once being established. An x-ray examination failed to show any stones, but showed what we took to be the outline of a kidney about four times the normal size. Up to this time it was impossible to tell which kidney was affected. It is true that during his first attack the pain was

located on the left side, but later it was equally severe on both sides. Repeated urinalyses failed to show the presence of casts, although there was always a small amount of albumin present with a greater or less number of white and red blood cells. On September 29th the second cystoscopic examination was made. Both ureters were again catheterized and after an interval of ten minutes there was no flow of urine from the left kidney, although the right kidney secreted freely. We were now one step further along in the diagnosis, as we knew that the right kidney was the one that was functioning. We now have the question of diagnosis to decide as nearly as possible. The history of the case would lead one to suspect renal calculus on account of the fact that he had several times passed small stones. The fact, however, that the  $x$  ray failed to show a stone casts some doubt upon this diagnosis. The cystoscopic examination has shown us that there is no stone in the ureter. Lead poisoning was considered owing to the man's occupation, but he shows none of the characteristic signs of this trouble. Nephritis seems to be ruled out by the repeated failure to find casts in the urine. The question of a tumor, most likely a hypernephroma, deserves consideration owing to the fact that the  $x$  ray apparently shows a greatly enlarged kidney on the left side. We are not able at this time to make a positive diagnosis, but we feel sure that the trouble, whatever it is, is located in the left kidney. Consequently, the operation which we are about to perform is exploratory.

### OPERATION

The incision is made in the usual way, the patient lying on his side and having the portion of the table opposite the lumbar region elevated to push the kidney upward. Great care is taken to see that the patient does not lie upon his arm. I once had the unfortunate experience of having a patient get a musculospiral paralysis from neglect of this precaution during this operation. The incision is made obliquely parallel to and a little below the twelfth rib. When we come down upon the fatty capsule we find that it is not normal, but is infiltrated and in places quite decidedly indurated, so that in most locations it is torn apart with

difficulty The fatty capsule is adherent to the kidney, and only in a few places can it be separated cleanly from the kidney, and in the greater part of the kidney surface portions of the fatty capsule have to be left adherent to the kidney This is contrary to the usual experience in dealing with a normal fatty capsule, in which case the kidney is easily shelled out of its capsule The kidney is about half again the average normal size, and upon palpating the pelvis I find a large stone I now make an incision into the pelvis of the kidney and extract this large stone You will notice that it is of very light weight for its size Upon exploring the calices with my finger I find a number of small fragments of stones, and these are removed with forceps I now place a drainage-tube in the pelvis of the kidney and close the wound

The question is Why was not this stone detected by the  $x$  ray? This question takes on an additional interest when I inform you that another patient in this hospital on the service of Dr Halstead had an  $x$  ray examination by the same radiographer, using the same apparatus at almost the same time as my patient Although this patient had even heavier abdominal walls than our patient here a stone was plainly shown The stone in this case was much heavier in proportion to its size than the stone we have here It is probable that the chemical composition of the two stones is different

The findings in the kidney are of interest in view of the fact that the pelvis was not dilated and contained no urine There was absolutely no evidence of any urine being present when the pelvis of the kidney was opened In view of the fact that the cystoscopic examination showed no obstruction of the ureter and the operation showed no sign of any obstruction to the outflow of urine from the pelvis of the kidney this case of calculous anuria is not due to any obstruction but simply to the presence of the stone Another question arises as to why the  $x$  ray apparently showed a kidney at least four times the normal size whereas the operation revealed the kidney only about one and one half times the normal size It seems possible to me that the infiltrated and indurated condition of the fatty capsule might account for this enlarged shadow

Postscript.—The stone measures  $3.8 \times 4.0 \times 2$  cm. in its longest diameters, tapering off toward the extremities, and weighs only 12.2 gm. The chemical examination shows it to be pure uric acid, tests for calcium salts and phosphates being negative. The chemical composition accounts for the light weight of the stone in proportion to the size, also for the difficulty of getting a shadow with the x-ray.

As to the after course: The patient passed 1 ounce of urine at 10 o'clock the day of the operation. The next day he passed 2 ounces at 7 A. M. and 3 ounces at 3 P. M., and larger amounts later, the total for the day being 14 ounces. The second day he passed 33 ounces and the third day 43 ounces, and from that time on the daily amount was normal. It is interesting to note that no urine ever came from the wound, showing that the kidney had not begun to functionate until after the wound was healed. The drainage-tube was removed five days after the operation. The wound healed throughout by first intention.



## CLINIC OF DR. EDWIN W RYERSON

### CHICAGO POLICLINIC HOSPITAL

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#### ANKYLOSIS OF ELBOW

*Summary* Fixation of right elbow joint due to arthritis deformans, technic of exposure of joint by long posterior incision, shaping the new joint, transplanting of free fascial flap—closure and after treatment, prognosis, comparative results of arthroplasties on elbow, hip, and knee

*October 6, 1916.*

THIS operation is an arthroplasty, or an operation to restore motion to a stiffened joint. The patient is a woman of fifty, whose right elbow is flexed at a right angle and has a range of motion of only 4 or 5 degrees. The condition is due to an osteoarthritis, or arthritis deformans, which never produces complete bony ankylosis, but which in this case has enormously impaired the motion of the joint.

Instead of the usual lateral incisions at either side of the elbow, I make a very long posterior incision, just avoiding the olecranon, and carefully dissect up the skin and fat on both sides, retracting the flaps widely so as to expose the entire back of the elbow region. The incision is 6 or 7 inches long, with its center at the olecranon.

The problem is now to expose the entire joint without doing any harm. I could saw through the olecranon, but it would not be as satisfactory as the method which I will show you. Starting at the upper end of the olecranon, I split the triceps tendon with a knife, cutting upward a distance of about 2 inches. This divides the tendon into two parts. The inner portion is now cut across where it joins the olecranon, and the outer portion is cut across at the top of the incision, 2 inches above, sparing as many of the muscle-fibers as possible. You will see, after the rest of the operation is finished, that it will be easy to sew together these



Posterior incision

1

2

Shows excellent exposure obtained by long post incision shown above

4

Line of deepening of olecranon fossa

3

T. Jones

5

Flap of fat and fascia covering entire lower end of humerus

Fig 74 —Operation for ankylosis of the elbow

two halves of the triceps with a number of interrupted sutures and to obtain a large area of contact and a very strong union. Now, in the space between the olecranon and the inner condyle I isolate the ulnar nerve and retract it out of the way. The condyles must now be exposed. The extensor muscles arise from the outer condyle, and the flexors from the inner. I take a chisel and remove a thin shell of bone from the external condyle, carrying with it the origin of the muscles. This is also done on the inner condyle. I now cut into the joint, severing as much of the thickened capsule and intra articular fibrous tissue as can be reached with the arm in this position. This is a very complete fibrous ankylosis with marked peri articular changes and it is hard to find the joint lines. The arm can now be acutely flexed and the rest of the restraining tissues divided.

Now, you see, the forearm can be completely dislocated, and the end of the humerus is completely freed. I must now remove a section of the lower end of the humerus at least  $\frac{1}{4}$  inch in thickness to give sufficient play to the joint. With this very sharp curved chisel, a carpenter's gouge, I take off the end of the humerus using a gouge of the same curve and size as the articular surface of the bone. Now with the flat file we smooth off the bone as accurately as possible.

Since the joint has been moved upward  $\frac{1}{4}$  inch, I must now make a new fossa for the reception of the coronoid process of the ulna which I do with a small gouge. The olecranon fossa on the back of the humerus must be similarly enlarged upward. All of the small fragments of bone must be carefully removed, as they are potentially osteogenetic and may cause trouble. Now I test the motion in the joint and find that it flexes very well through the full range of motion from a right angle, but it does not extend well at all. This is due to the structural shortening of the biceps, and can probably be overcome by exercises. It does not seem wise to attempt a plastic lengthening of the biceps at this time.

I now have to make a flap of soft tissue to place between the bones to prevent ankylosis. There does not seem to be enough tissue in the neighborhood to make a satisfactory flap, so I will remove a piece of the fascia lata. This is done through an incision

ion on the right thigh and a piece of fat and fascia about 3 by 5 inches is quickly removed. These fascial flaps never seem nearly as large after they have been taken out. We do not need much fat on the flap but only a thin layer.

Now I will lay this flap over the entire end of the humerus and be sure that it is carried well up in front of the bone. The flap is now sewed securely all around the end of the bone except at the lateral ends of the condyles where the flexor and extensor origins have to be reattached. I think that a perfectly free flap of this kind actually gets as much nutrition as a flap with a narrow pedicle since a pedicled flap must always be rotated or turned over to such an extent that its original blood supply is probably cut off by constriction. At all events the free flaps have given satisfactory results quite as often in my experience as the pedicled flaps.

The split and divided triceps is now sutured with eight or ten interrupted chromic catgut stitches and you see what a large area of union this method affords. It will be quite safe to begin active and passive motion within two weeks whereas one might have considerable hesitancy in doing this if the olecranon had been sawed and then wired or sutured.

The elbow joint gives excellent results after arthroplasty in the majority of cases. The hip joint gives the next best. The knee-joint unfortunately where we should like very much to get good results is an extremely difficult proposition although a few good cases are on record.

The question always arises whether or not the joint will later stiffen. The experiments of Allison and Brooks<sup>1</sup> tend to make one believe that sooner or later the ankylosis will recur although their experiments were made on animals. Perhaps on the human the results will be different. It would of course seem undesirable to put more fibrous tissue in the shape of fascia into a joint which is already the seat of a bony or fibrous ankylosis but we are certain that many joints which have been operated on in this way have remained movable for at least a year. We know that the hip-joint in several of our cases has remained movable for at

<sup>1</sup> Allison and Brooks Jour Amer Med Assoc 1915 lxxv p 391

least two years, though it will take several more years of observation before we can be absolutely certain about the results. The knee-joint is technically the most difficult because so much of the stability of the knee joint depends upon the ligamentous structures. The elbow and the hip depend much more upon the bony architecture than upon the ligamentous tissues. We can not artificially, at the present time, reproduce the crucial ligaments of the knee. Fortunately, the crucial ligaments are not quite as necessary for the lateral stability of the knee joint as they are for the anteroposterior stability. We can reproduce fairly well the lateral ligaments of the knee-joint, and many good arthroplasties exist without any disabling lateral instability. I do not feel that the position of the knee arthroplasty is as yet fully established. Dr. Murphy, as you well know, was enthusiastic in the field of knee arthroplasty. He believed that it was possible uniformly to get good results, but most other operators have failed to do so. We have all had some good ones and we have all had some bad ones. It appears at the present time to many of us that, in a case where there is bony ankylosis between the femur, tibia, and patella, the chances of obtaining a good movable knee joint are not very bright, that if bony ankylosis exists between two of the bones only, for instance, between the patella and the femur or else between the tibia and femur, we can hope for better results. The ankylosed hip and the ankylosed elbow can be operated on very confidently by the proper technic.

It is likely that we shall not have perfect motion in this arm for a long time, and it is barely possible that we shall not have perfect motion at any time, but the patient will be able to flex the elbow, which is of great importance. She will be able to sew and to do her hair, which has been impossible for two years.

This woman has had her tonsils removed and her teeth extracted, and for a time vaccines, made from the abscessed teeth, were injected subcutaneously. All the acute symptoms of arthritis deformans have disappeared and there remained previous to operation only the restriction of motion in the elbow joint. We should not have attempted to mobilize this joint if the patient were still suffering from an active arthritis deformans.

There is now plenty of flexion in the elbow. I am not going to try to overcome the biceps contraction for the present. You see she has very good pronation and supination. This is the first exposure of the elbow joint I have ever made by the long posterior incision, and I think it is a perfectly sound and good method. The reason I am putting this arm up in an internal angular splint is that I do not want any weight to be borne on the joint. The flap is poorly enough nourished, whether it is a free flap of fascia lata or a slightly pedicled flap, so to do a successful arthroplasty the operation should be followed by traction. In the arthroplasties on the hip we always use a heavy traction with a 16- to 25 pound weight and maintain that traction for four to six weeks, because we do not want any pressure on the flap. In this woman we will put on a splint and, if necessary, put a weight on the inner side of the splint on the forearm, so it will draw the joint surfaces farther apart. We can support the hand in a sling and she will get along very well.

## CLINIC OF DR. D B PHEMISTER

### PRESBYTERIAN HOSPITAL

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#### ECHINOCOCCUS CYST OF THE LIVER COMPLICATED LATER BY SUBPHRENIC PYOPNEUMOTHORAX AND HYDROPNEUMOTHORAX

*Summary* History and physical examination of patient, differential diagnosis of echinococcus cyst of liver from hemangioma, cystic lymphangioma, primary and secondary carcinoma, subphrenic and hepatic abscess, syphilis of liver, hydrops of gall bladder, value of complement fixation test in diagnosis of echinococcus operation—Sprengel incision—marsupialization of cavity, development of subphrenic pyopneumothorax four weeks after operation, diagnosis and treatment of this complication, development of hydropneumothorax following the subphrenic lesion—diagnosis and treatment

*October 19, 1916.*

HERE is another equally rare and interesting case which was admitted to the hospital seven weeks ago. This woman is thirty-eight years old. She is a Greek and has been in the United States for six years. She has been married eleven years, has had two miscarriages, each at the third month, but no living children. She has always been well until four years ago, when the present trouble began.

While washing one day she was taken with pain in the right upper quadrant of the abdomen. The pain was so severe that she had to quit work. She had nausea and vomiting. The pain radiated to her back to some extent. It wore off gradually, lasting for two or three days. She soon had a recurrence and during the next two years had repeated attacks of pain in this region. On only one other occasion were they associated with nausea and vomiting. About a year after the onset of these attacks she noticed a swelling beneath the right costal margin low down. This swelling has persisted and gradually increased in size. During the past two years she has had more or less

constant pain in the region of the liver Her general health has been fairly good She has never been jaundiced even with the first attacks She has lost 10 or 12 pounds in weight, though she is still well preserved She has had no symptoms in any other part of the body Her appetite has been good, howels regular There has been no diarrhea or constipation On account of the pain she has been more or less incapacitated for work though she has done her housework most of the time The venereal history is negative

On admission to the hospital examination showed a fairly well nourished woman weighing about 150 pounds Her skin was dark, but there was no evidence of jaundice The results of the examination of the head, neck, and extremities were negative On inspection of the abdomen I observed she had a tumor mass which could be seen in the right side beneath the costal margin, beginning at about the outer fold of the rectus muscle and extending downward and backward It was an oval shaped swelling On palpation it was smooth rounded and regular in outline It seemed to be attached to or continuous with the lower border of the liver The sharp edge of the left lobe of the liver could be felt and followed over to the mass The gall bladder could not be palpated The mass moved with respiration Examination of the rest of the abdomen was negative No fluctuation thrill, or fremitus could be felt on palpation of the mass Examination of the chest was negative except the right thorax, where liver dullness extended much higher than normal There was flatness at the fourth rib anteriorly, the sixth rib laterally and the eighth rib posteriorly and very slight respiratory mobility of the lower border of the lung decreased breath sounds, and tactile and vocal fremitus over the dull area Fluoroscopic examination of the chest and abdomen showed this dullness to be due to enlargement in the hepatic region which displaced the diaphragm upward and restricted its normal mobility The palpable mass in the abdomen was continuous and movable with the lower border of the liver

What lesions would you think of in explanation of these symptoms and findings? You would think of a liver tumor

What tumor of the liver might produce this picture? Of the liver tumors, you would think of a hemangioma or a cystic lymphangioma. These conditions rarely produce swellings of this size. They are common autopsy findings, particularly hemangiomas, but are small lesions which make no symptoms. What else would you think of? A carcinoma of the liver. Primary carcinoma of the liver is extremely rare. Metastatic carcinoma, secondary especially to a primary cancer of the stomach or large bowel, is extremely common. But this patient presents none of the evidences of a malignancy and no signs of a tumor of the gastro intestinal tract. Stomach and stool analysis and a complete barium ingestion and enema were negative. This tumor is smooth and large, while carcinoma metastases are very nodular. The blood showed 85 per cent hemoglobin, 9000 leukocytes, and a practically normal differential count—22 per cent small lymphocytes, 13 per cent large lymphocytes, 3 per cent large mononuclears, 2 per cent eosinophils, 60 per cent neutrophils—so her general condition and the blood findings would speak against a malignancy.

We might think of a subphrenic or a liver abscess, but she had no evidence of an infection, so that, with the history of four years' duration, is against a subphrenic or liver abscess. This mass was attached to the liver and did not go back to the kidney region. The urine examinations were negative, which would help to rule out a kidney lesion.

You have to think of an enlarged gall bladder. This might have been a cholecystitis with stone in the cystic duct producing a hydrops of the gall bladder, but the location of the mass ruled out gall bladder trouble. It extended too far to the right and downward and was too definitely blended with the liver. A distended gall bladder extends downward from the tip of the ninth costal cartilage beneath the rectus muscle and does not go to the right as with this tumor.

One of the first things I thought of was an extensive gummatous involvement of the liver. The left lobe of the liver is more often involved by palpable gumma than the right. Of course, the left lobe can be felt easier than the right. We are not apt to see



large gummatous masses after four years of symptoms from a syphilitic involvement of the liver. We may see them but what frequently happens before that time is this. First you get the gummatous tumor formations which are palpable and then in six months to two years healing occurs with contraction and instead of an enlargement you get a shrinkage of the liver. I have seen autopsies where the left lobe was practically obliterated by the healed lues. In this case two Wassermann tests were negative.

This leaves only echinococcus cyst for consideration. What is there about the patient to make you think of this possibility? Her nationality. echinococcus disease is common in all the eastern Mediterranean countries. Most of the cases we have had in the Presbyterian Hospital have been in Greeks. What about her home life? She has been in America six years and has had no dog here but had a dog about the home in Greece and we know that the dog is one of the hosts of the adult *Tænia echinococcus*. The long duration of the process and the excellent general condition of the patient speak strongly for echinococcus. Urticarial attacks which are common in the disease have been absent in her case. The percentage of eosinophils which may be markedly increased in echinococcus disease is normal. The complement fixation test using the patient's blood and the fluid from an echinococcus cyst operated on here one and one half years ago and kept in sealed tubes was strongly positive. This reaction introduced by Weinberg is as valuable in the diagnosis of echinococcus as is the Wassermann reaction in syphilis.

Six weeks ago the patient was operated on under this diagnosis. The abdomen was opened by the Sprengel transverse incision beginning just above and outside of the umbilicus and extending outward across the abdomen beneath the lateral costal margin (Fig. 75). The rectus was cut transversely the external oblique detached from its costal attachment and the internal oblique and transversalis muscles split in the direction of their fibers. On entering the peritoneal cavity the mass was found to be in the right lobe of the liver. It rounded off the liver edge and extended internally to the gall bladder and posteriorly to the

posterior portion of the liver. The space between liver and diaphragm was obliterated anteriorly by adhesions. The liver substance was markedly thinned out over the swelling and palpation revealed fluctuation. I aspirated and obtained a clear fluid. I

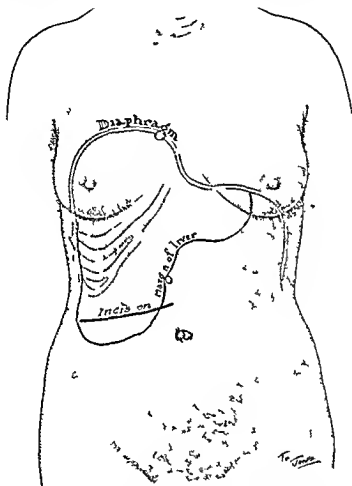


Fig 75—Diagram illustrating the great enlargement of the liver due to the cyst and especially its encroachment on the right pleural cavity. The line of the Sprenkel incision is also indicated.

opened this cystic cavity by a longitudinal incision along the margin of the liver about 3<sup>1</sup>/<sub>2</sub> inches in length. The liver substance was so thinned that in most places it was only 5 to 8 mm thick. In some places there was only a fibrous capsule forming the wall of the cyst. When I opened the cavity large numbers of the

*echinococcus* cysts escaped Here they are (showing specimen), and, as you see, vary in size from a pea to an egg I used a gall-stone receptacle as a scoop for emptying the cavity About 3

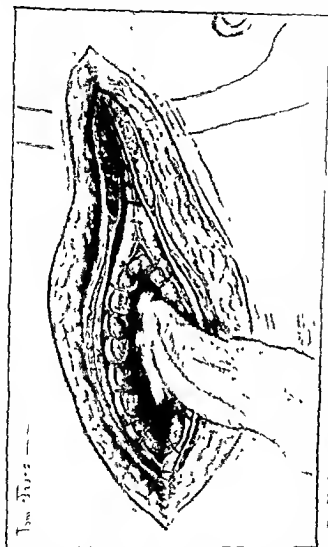


Fig 76—Marsupialization of the cyst The edges of the incision in the cyst have been stitched to those of the peritoneal incision and the cyst cavity packed with gauze Note the transverse section of the right rectus muscle which is permitted by this incision

quarts of fluid and cysts were removed After removing all that I could with this scoop, I introduced my hand up to about the middle of my forearm into the cavity which extended upward and

backward well toward the diaphragm. I succeeded with my fingers in breaking into some cavities that had not been opened and more cysts escaped which I removed with my hand. A bi-manual palpation of the rest of the liver was made in search of other cysts but none were found. The cavity remaining was lined by a thin irregular layer of fibrous tissue and only partially collapsed. A large strip of gauze was carried to its bottom and marsupialization performed by suturing the edges of the opening to the peritoneum external to the rectus all the way around (Fig 76). This is a practice that can be resorted to in case of echinococcus or other cysts in many locations of the body where excision of the wall cannot be practised. The abdominal cavity was closed with the gauze strip brought out of the wound. In five days the gauze was removed and replaced by a rubber tube. The wound healed by primary union but after twelve days the discharge from the tube became seropurulent and from time to time cysts escaped on irrigation which was practised daily with a boric acid solution.

It is now about six weeks since the operation and her general condition has remained good. The moderate amount of discharge has shown little abatement. It will no doubt continue to discharge for some months as the cavity is held open by the rigid liver walls. Six to twelve months are sometimes necessary for the filling in of these cavities. Of course I cannot be sure that all the cysts are out as some have escaped since the operation and there may be still one or more large pockets which have not been opened. Any remaining cyst may eventually be discharged and healing occur or the process may spread and make further trouble. Another danger is that of implantation cysts in the peritoneal cavity. Despite careful walling off a certain amount of fluid must have gotten into the peritoneal cavity. To avoid this occasional complication the operation may be done in two stages. First suturing the wall to the peritoneum picking the area with gauze and then after seven to ten days opening and emptying the cavity.

## SECOND CLINIC, NOVEMBER 8, 1916

Since showing you this patient, operated on for echinococcus cyst of the liver a marked change has come about in her condition. She continued to do well with a temperature around nor-



Fig 77.—Röntgenogram (plate reversed) showing the subphrenic pyopneumothorax. The area enclosed by the dotted line represents the location of the gas above that is the compressed lung. Below is a denser area representing the liquid and below that the location of the original liver lesion, the lower limit of which is indicated by the shadow of the safety pin used to anchor the drainage-tube in the old subcostal wound.

mal until two weeks ago, when she developed pain in the liver region and the temperature went to 102° F. The pain continued and the temperature went to 103° F. of afternoons. On the fifth day a catheter was introduced into the depths of the wound and about 1 pint of foul smelling pus and cysts washed out. After

this the symptoms subsided somewhat, but soon returned, and for the past five or six days have been about as before, despite the daily irrigations. The leukocytes have ranged from 12,000 to 16,000. The dulness over the lower portion of the right chest



Fig 78—Diagrammatic representation of pathologic anatomy following drainage of the subdiaphragmatic pyopneumothorax

has gradually shifted upward until yesterday it extended to the second rib anteriorly.

The chest was fluoroscoped and a very unusual condition revealed (Fig 77). The right lung was crowded upward and collapsed by the diaphragm, which extended to the third rib anteriorly. Beneath the diaphragm there was a dome-shaped pene-

trable area with a sharp line representing a fluid level below Shaking and changing the position of the patient caused this fluid line to shift The diaphragm moved slightly on respiration A further physical examination of the chest then revealed dullness over the lung about the second rib slight tympany over the third interspace and fourth rib and dullness below the fourth rib Splashing could be heard over the tympanitic area on shaking the patient The diagnosis was made of subphrenic pyopneumothorax (Leyden) or an air and pus cavity between the diaphragm and the dome of the liver

A transpleural drainage of the cavity was decided on Under local anesthesia  $2\frac{1}{2}$  inches of the eighth rib were resected beneath the angle of the scapula The parietal pleura was thin and transparent The lung was displaced upward so that it lay entirely above the field and the diaphragm could be seen pressed in contact with the parietal pleura over which it moved during respiration An elliptic area of the pleural cavity 2 inches long was walled off by the passage of a row of interlocking sutures through the parietal pleura and the diaphragm suturing them together This walled off area was then cut through into the subdiaphragmatic space where a large cavity was found filled with foul smelling gas and pus and hundreds of various sized echinococcus cysts Upon irrigation it was found that this cavity communicated with the one opened at the first operation from which the infection had no doubt extended (Fig 78)

With the patient on her back the irrigating solution was then introduced through the old opening and the cysts and pus washed out through the new one A drainage tube was introduced into the abscess cavity

Her temperature has dropped to normal since the operation and she feels very much better As nearly as I can tell there was no extension of the disease process through the diaphragm into the pleural cavity

### THIRD CLINIC NOVEMBER 18TH

Still another interesting complication has developed since the patient was last shown

Following the drainage of the subphrenic pyopneumothorax the temperature dropped to a level of evening and 99° 5' to 100° F. of afternoons for four or five days. Then it went to 101° to

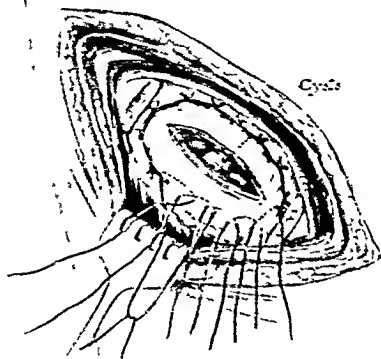


FIG. 79.—Drainage of subdiaphragmatic pyopneumothorax. About 3 inches of the seventh rib in the posterior axillary line has been resected subperiosteally. The diaphragm has been united to the chest wall by a ring of interlocking sutures and the abscess incised. Note the echinococcus cysts in the depths of the wound. The bulging noticed just above the upper angle of the skin incision indicates the angle of the scapula which has been drawn up due to the elevation of the arm above the patient's head. When the arm was brought down to the side after the operation the scapula descended upon the drainage tubes. Later adhesions developed between tissues about the incision and the scapula interfering with the motion of the arm illustrating some of the disadvantages of drainage at that level (see text).

101° F. of afternoons and the patient developed a slight cough. The wound has been irrigated daily and cysts have been obtained



a number of times The discharge is less purulent but quite profuse

Examination of the chest soon after the operation showed the typical findings of a pncumothorax on the right side As the slight elevation of temperature has persisted we have examined the chest repeatedly and recently have found evidence of fluid as well as air in the chest A needle was introduced and a serous fluid removed which was rich in albumin and leukocytes but contained no scolices or hooklets At the present time there is considerable fluid in the chest and distinct splashing sounds can be heard even at a distance on shaking the patient Here is an x ray plate of the chest which shows the air above the fluid s distinct level and a small amount of air still present in the space beneath the diaphragm

Apparently the hydropneumothorax arose by leakage of the transpleural wound permitting some air and infected material to enter the pleural cavity This was not apparent at the time but may have occurred during the washing out of the cavity as the patient coughed considerably during the procedure This could have been avoided by a two stage operation opening the abscess two days after suturing diaphragm to parietal pleura (A needle was introduced and 1000 c c of fluid withdrawn with a Potain apparatus ) By pumping out the fluid with this arrangement no air is allowed to enter the pleural cavity and the lung expands to take the place of the fluid This hydropneumothorax should not be a serious complication unless the echinococcus has also extended through the diaphragm

## CENTRAL FIBROMA OF MANDIBLE

*Summary* Patient a young woman, with good sized tumor of mandible which has been present four years description of tumor differential diagnosis of tumors of mandible operation, histology of central fibromas of the mandible

*September 15 1916*

### HISTORY

THE patient, a single woman of twenty one years, was admitted to the Presbyterian Hospital September 13, 1916, because of a swelling of the lower jaw



Fig 80—Myeloid sarcoma of jaw

Four years ago a painless swelling appeared on the left side of the jaw anteriorly This gradually and silently increased in

size until it has now reached the dimensions of an orange. There has been no pain in connection with the swelling and no disturbance in chewing or swallowing. There has been some feeling of weight in the jaw as the tumor has approached its present size (Fig. 80).

The general health of the patient has remained good, her weight remaining constant for the past two years.

### EXAMINATION

Examination shows a rather frail, fairly well nourished young woman. There is no evidence of cachexia or emaciation. There is a smooth tumor mass in connection with the left side of the lower jaw about the size of an orange. It involves the body of the jaw and extends from the second molar on the left side anteriorly and around to the bicuspid on the right side. It is bony in consistency. No parchment crepitation can be felt. On inspection and palpation within the mouth the tumor is found to extend upward on the alveolar process about the base of the teeth and does not involve the overlying mucous membrane. There is no malalignment of the teeth. The veins over the tumor are slightly dilated. There is a palpable gland in the left submaxillary triangle about the size of a bean, which raises the question of metastasis. No other enlarged glands can be felt. The x-ray picture shows an expansile oval swelling of the jaw with a thin cortical rim and casting a faint shadow in its central portion. There are some irregular central shadows and it is difficult to say whether they are due to irregularities in the cortical bone or to internal trabeculae (Fig. 81).

This case presents an interesting problem in diagnosis. That it comes under the general heading of tumor and began in the interior of the body of the mandible there can be little room for doubt. We can divide the central tumors of the jaw into those which arise from the tissues of the jaw proper and those which arise from the dental system.

Of the tumors from the tissues of the jaw the benign are less frequent than the malignant. The commonest of the benign tumors is the fibroma or, as it is sometimes poorly called, internal

epulis It develops slowly and painlessly, producing a circumscribed expansile swelling of the jaw. As the bone is destroyed on the inside the periosteum forms a new layer on the outside, so that the tumor is practically always surrounded by a thin bony



Fig 81—Central fibroma of mandible Note the shadows suggestive of bony trabeculae dividing the interior of the tumor into numerous cavities

shell even when it reaches large size, which requires many years The tumor is made up of fibroblasts with occasional giant cells and bony trabeculae, but the tendency to ossification is very slight Degeneration with cyst formation may occur in the larger tumors Transformation into slowly growing sarcomas sometimes results,

and every fibroma of the jaw should be looked upon as potentially malignant. Pure chondromas of the jaw are extremely rare and the presence of cartilage in a tumor usually means that it is a chondrosarcoma. Myxomas and angiomas are almost unknown in this location. Osteoma of the lower jaw is not so rare but usually occurs as an exostosis which makes its diagnosis easy. The expansile type of exostosis makes a tumor similar to this case but the x ray shows a dense bony interior in contrast to the faint shadow cast by this tumor.

Central sarcoma of the lower jaw usually belongs to the giant celled type. It is slow growing, expansile, erodes the bone from the interior and possesses very little tendency to ossify. A thin cortex is formed about it as it increases in size. This may not keep pace with the tumor growth which in places will break through while in other places a parchment crackling may be felt over it. There is little tendency to metastases and the prognosis after careful removal is very good.

Rarely a round or spindle-celled central sarcoma is seen with its more malignant tendencies.

A variety of jaw tumors arises from the dental system but practically only one form reaches the dimensions presented by this case. Odontomas are as a rule very small. Root cysts and follicular dental cysts rarely surpass the size of an egg. x Ray usually shows rudimentary teeth in the follicular cysts. Multilocular cystoma (or in its solid form adamantinoma) if left untreated usually forms a large tumor of the jaw. It arises from the peridental epithelial debris of Malassez which comes from the enamel organ. The solid form is rare. The tumor arises in the central portion of the jaw as a mass of epithelium which resembles histologically that of the enamel organ of the fetus. As it increases in size cysts form which may be independent but which usually are multilocular and may even be separated by bony septa. Such a multilocular cyst may reach enormous dimensions as in the case operated on in this hospital by Dr. Dean Lewis and reported in *Surgery Gynecology and Obstetrics* January 1910. Fluctuation may sometimes be elicited and parchment crepitus is common.

Narrowing it down, the diagnosis in this case would seem to lie between central fibroma, myeloid sarcoma, and multilocular cystoma. Because of the absence of bony septa I feel that it is probably not multilocular cystoma. It is hard to differentiate between the first two conditions, as the period of development (four years) would be consistent with either. However, I feel that it is most likely a myeloid giant celled sarcoma.

### OPERATION

A horseshoe shaped incision is made along the lower border of the tumor and extended backward on the left side over the



Fig 82—Central fibroma of mandible. Röntgenogram of a segment of the tumor showing that the subdivision by bone trabeculae (see Fig 81) was only apparent, due to the irregularities of the inner surface of the bone shell which surrounds the tumor.

submaxillary triangle. The skin-flap is reflected anteriorly to the mucous membrane of the mouth, which is then carefully dissected off beyond the limits of the tumor to the margin of the gum. In one place it is nicked and the mouth cavity opened. This is at once closed with a silk suture. Posteriorly the muscles attached to the symphysis of the jaw are cut away and the mucous membrane carefully separated by blunt dissection. The tumor

is now freed of its covering. I want to preserve the alveolar portion of the mandible, including the teeth and without breaking the mandible, so that there will be no malalignment of the teeth. With a motor saw I cut the bony cortex at the limits of the tumor. I fear that the alveolar process would be broken if a hammer and chisel were used. I have to break the thin cortex posteriorly by pressing on the tumor, as the saw cannot be used in that loca-



Fig. 83—Central fibroma of mandible. Photomicrograph showing typical structure—*islands of bone (dark areas) and osteoid tissue (solid areas of medium tint) embedded in a very cellular mass in which are degenerating foci (non-staining areas especially numerous in upper right quadrant)*

tion. Now that I have succeeded in removing the tumor, I will trim up the margins with a bone-cutting forceps and curet the bony surface that is left. You see that it is a solid tumor with some small cavities about the limits through which I have broken. It does not look very malignant and until it is cut open I will not venture a diagnosis. Now that the remaining bony surface has been thoroughly curetted, I will anchor the detached muscles as well as possible to the soft parts of the chin. (Skin closed with

interrupted silk sutures—gutta percha drain ) I did not remove the contents of the submaxillary triangle because this process does not look malignant

**Postoperative Course**—The wound became slightly infected but healed in three weeks leaving considerable depression of the chin

**Pathologic Report**—The tumor consists of an outer bony covering and a firm but soft interior which grates in places when cut There are no cysts or areas of degeneration within the substance of the tumor proper Microscopically it consists very largely of cells resembling fibroblasts but without any mature areas such as one may see in a fibroma Scattered bony trabeculae and islands of osteoid tissue are to be seen although the amount of ossification is slight as is shown by an x ray picture of a segment sawn out of the tumor It will be seen that most of the shadow is cast by the cortical rim of bone (Fig 82) An occasional giant cell is to be seen There are no mitotic figures or deeply staining nuclei (Fig 83) From the pathologic findings I would classify this tumor as a central fibroma of the jaw with slight ossifying tendencies One cannot be sure that had the tumor been left alone it would not eventually have become malignant in which case it would be classed as a myeloid sarcoma





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